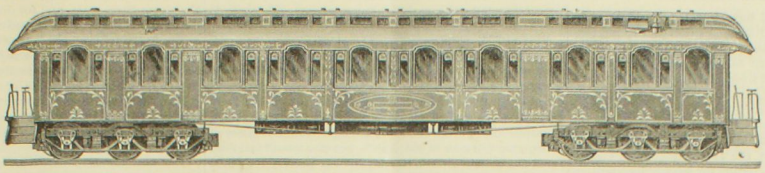
NATIONAL CAR AND LOCOMOTIVE BUILDER.



VOLUME XVII. } NOVEMBER, 1886. { SINGLE NUMBERS, TEN CENTS,
NUMBER 11. } { $1.00 PER ANNUM.

Miscellaneous Items.

THE Cincinnati, Wabash & Michigan Railway are equipping 100 new cars with the Baldwin Automatic Coupling. This coupler is fast gaining ground, and is the subject of much attention in railroad circles.

THE Ward Axle Brake & Coupler Co., of Monongahela City, Pa., has notified Mr. Rhodes, Chairman of the M. C. B. Committee on Freight Train Brakes, that it will enter its brake for trial in the tests to be held in April, 1887.

GEN. SUPT. KERRIGAN, of the Missouri Pacific System, says he has in use on his locomotives a large number of the American driver and tender brakes, and that they have much more than paid for themselves in the operation of freight trains.

THE Montreal shops of the Canadian Pacific Railway have just turned out the first consolidation locomotive engine built in the Dominion. Four in all are to be built, each weighing 51½ tons, with a 19-inch cylinder and 22 inches stroke; diameter of driving-wheel, 51 inches.

THE *Southern Industrial Record* says that the lumber interests of the South are growing to enormous proportions, and that the increase of the timber and lumber trade is so great it is difficult to find prompt transportation to market. The railroads, in the mean time, are making large additions to their rolling stock to meet the demand.

WE have heard the assertion publicly made that passenger cars cost about 15 cents for brake shoes for every thousand miles run. This seems to be a very high figure, but it is very hard finding reliable data. If any of our readers can give us accurate information on this subject, it will be thankfully received.

THE Northern Pacific Terminal Company, of Oregon, which expended a large sum of money some years ago in preparing a site and in building the foundation intended for very large railroad machine shops at Albina, Ore., have determined to go on with the work that was begun, but suspended. The plans have been greatly modified, but they still call for a very extensive establishment.

THE British traveling people and railway men are agitating against the practice of running mixed trains. They want each train to be all passenger or all freight cars. Those who favor retaining the mixed trains wish to have the passenger cars put in front, the belief being expressed that the front is the safest part of a long train. Few American railroad men would support that view of the matter, at least in regard to American railroad trains.

MR. JOSEPH TOWNSEND, master car-builder, has been quite busy in the Chicago, Alton & St. Louis shops at Bloomington for the last year. He is now getting in the fine new transfer table illustrated in our last issue. The company have built a good many new cars of different kinds during the last year, and business still keeps a little in advance of the supply. Repair work is very heavy, and in addition to that, the shops have now on hand 6 new passenger coaches, 6 new postal cars, all of the company's standard, and 50 new refrigerator cars.

THE discouraging outlook for railroad business last spring has been followed by a widespread activity in both freight and passenger traffic. There can be no better evidence of this than the great demand for cars from all points where heavy freight movements converge. In anticipation of the increase of freight business which would follow the harvesting of the crops, a great many heavy orders for cars have been given within the past three months, and the road and contract shops are full of work in supplying the immediate demand.

ONE of the latest inventions that is calling on railroad companies for patronage is a means of weighing railroad cars when the train they are on is thundering along at full speed. A simple means of weighing cars is likely to be accepted as of high value, but modest men like freight agents are satisfied to have the weights taken under less exciting conditions than when the train is running 40 miles an hour. They say let us have cheap and reliable means of weighing cars standing on the side track in the first place, and as the world gets moving faster we may come to think well of a proposal to weigh cars while they are in motion.

IT is reported that during a recent visit which Mr. Jay Gould, president of the Missouri Pacific Railway, made to Kansas City, he made a proposition to locate the repair shops and mechanical headquarters of the Missouri Pacific system at Kansas City. The road has no really good shops at present, and it will be an important advantage to Kansas City if first-class shops, capable of doing the large quantity of repair work needed for the Missouri Pacific, are located there. Many important towns on the line of the road would bid pretty high for the favor offered to Kansas City.

THE Chicago, Rock Island & Pacific road, in connection with its extensions through Kansas and Colorado, is going to build extensive new locomotive and car repair shops in Kansas. The intention is to put up first-class buildings and equip them with the best tools that can be procured for doing work properly. A few days ago, Mr. Twombly, general master mechanic, and Mr. Verbryck, general master car-builder, accompanied President Cable to the location of the shops, for the purpose of consulting about the plans. Work on the buildings will be commenced as soon as the plans can be got ready.

THE latest discovery made by our English cousins interested in railway machinery is that the combined center car coupling and buffer did not originate in America, although it is universally used on American railroads. Like the four-wheel truck, the steel fire-box, the sight-feed, the sewing machine, the telephone and a great many other inventions fondly believed by Americans to be the product of their nation's inventive genius, the center car coupling is now said to be an old English device that strayed from home to meet wide application. So the president of the Institution of Civil Engineers recently asserted.

THERE is a master mechanics' association belonging to the Chicago, Burlington & Quincy Railroad and its connecting lines, which meets every four months when subjects of mutual interest are introduced for discussion. No changes on the standard dimensions of machinery belonging to the roads are made until all the pros and cons are discussed at these association meetings. Although the road is very progressive and has the very best methods of ascertaining the value of devices tried, changes are made slowly and after thorough deliberation. The multitude of counselors prevents many an appliance from being approved or condemned by impulsive favor or prejudice.

IT is announced that the use of horses on the New York Third Avenue Street Car Line will soon be superseded by electric motors, in order to test the economy of this method of propulsion and run the cars with greater speed. The result of the experiment will be watched with a good deal of interest, for the reason that the avenue is also traversed by a steam elevated road, and there will be a direct competition between this and the electric system, at the same fares. At certain hours of the day there is traffic enough for both. At present it is very unequally divided in consequence of the recent reduction of the elevated fares to five cents at all times, and in order to get back what they have lost, the surface line will have to increase the speed of its cars to at least 12 miles an hour, and also make the cars far more attractive, inside and out, than they ever have been. To see handsome, luxurious cars propelled at high speed by electricity on the old Third Avenue, will be an event of the age. Let us hope that nothing will occur to frustrate the undertaking.

AN examination of the performance sheet of the middle division of the Wabash, St. Louis & Pacific Railway reveals some interesting points about the performance of the locomotives. During the month of August, there were 162 locomotives on the division, and the whole ran an average of 2,901 miles. It is generally asserted that the extension front, although a good means of arresting sparks, does not effect any economy in the use of fuel. The record of the Wabash locomotives seem to show otherwise. The average consumption of fuel for all the engines was 67 pounds per mile, or 29.8 miles to the ton. There are twenty engines on the road equipped with the Barnes extension front and smoke-preventing device. The average consumption of coal by these engines was 42.7 per mile, or 46.8 miles to the ton. One of the latter engines running a passenger train of five cars daily, did the work with 29.29 pounds to the train mile, or 70.7 miles to the ton. If any road is making a record equal to this, we would like to learn the particulars.

ONE of the most economically operated roads in the country is the Milwaukee, Lake Shore & Western. The company have in operation 534 miles, and in this there are nineteen grades that range from 6,000 to 8,000 feet in length, and rise from 1 to 1.2 foot per 100 feet; and five grades over 15,000 feet in length, that rise over 1 foot per 100 feet. The average curvature on the grades is two 6° curves. With these physical disadvantages to contend with, the locomotives make a very fair record. In May last the engines made an an average of 17.6 miles to the pint of oil, and 46.9 miles to the ton of coal; in June 15.7 miles were run to the pint of oil and 48.3 miles to the ton of coal. The same record on oil was made in July, and 48.8 miles were run to the ton of coal. All the locomotives are of the American eight-wheel type, with cylinders 17 × 24 inches, wheels 5 feet diameter, and total weight 85,000 pounds. The spark arresting and draft regulating appliance shown in the NATIONAL CAR AND LOCOMOTIVE BUILDER of February last, are used in all the engines.

IN an interview with a reporter regarding the labor trouble which led to the great strike at the stock yards of Chicago, Mr. P. D. Armour, the largest pork packer in the world, said that working short hours would not enable Chicago packers to compete with their rivals in Kansas City and Cedar Rapids. The importance which the latter place has attained is due to the railroad interests that have grown up around it. Fifteen years ago Cedar Rapids was a rural village with little prospect of ever being more than a trading center for the farmers of the district, but about that time the Burlington, Cedar Rapids & Northern Railway Company located their mechanical and clerical headquarters at the place, and it began at once to rise toward prosperity. Sinclair & Co. located their pork packing establishment there shortly afterward, and many small manufacturing concerns have since found the town a convenient point to settle in. The town now contains upward of twenty thousand inhabitants, is growing rapidly, and as a center of trade is contributory to districts through which ten railroads radiate. The place has also been fortunate in the liberal and progressive people who have taken the lead in its affairs and have done so much to attract new enterprises.

AN impression prevails very generally that the locomotive is most wasteful as regards fuel, and that is far beyond the stationary engine in the amount of coal required per horse-power per hour. This is contrary to fact, for a first-class modern locomotive is quite as economical as the average stationary engine. This is dealing in generalities and assertions, but there is no need to go behind tests for proof. It is on record that a locomotive, in daily use, and not especially prepared for test in any way, can produce a horse-power for 3.2 lbs. of coal per horse-power per hour. This has been shown by a Baldwin engine on the Philadelphia & Reading R. R., as the result of regular runs between New York and Philadelphia, and can, without doubt, be duplicated, and perhaps exceeded in economy, upon other railroads. Few, if any, stationary engines, automatic excepted, run so low in coal per horse-power as a first-class locomotive. It is surprising that it should be so, considering the losses from radiation, short boiler, rapid combustion, and the great heat of the smoke-box, but to counterbalance these there are very high initial pressures and high grades of expansion, which latter advantages place the locomotive favorably with modern steam power machines.—*Mechanical Engineer*,

Engineering and Shop Notes.

STOPPING FOR CROSSINGS.

During the last month I have traveled considerably on the railroads in Illinois, Indiana and Iowa, and found that most of the roads were doing a heavy freight and passenger business. Trains of ten to fifteen passenger cars are quite common on the trunk lines, and are generally pulled by one 17×24 locomotive, the load taxing its tractive power pretty well. All over I hear talk of the necessity for larger locomotives for this kind of service. The ordinary engines are heavy enough to keep the trains going after they are started, but the frequent stoppages cause loss of time in starting. Agitating for heavier locomotives appears to me a waste of mental force. The agitation ought to be in favor of making fewer stops. Stopping for a railroad crossing is paying expensive tribute to senility or to ignorance. The system of interlocking signals and switches has made it practicable to pass a protected crossing at unbroken speed with greater safety than it is possible to pass unprotected crossings after having stopped for them. The greatest obstacle to the equipping of crossings with interlocking signals is, that the laws of most States require trains to stop anyhow. This is a matter which the intelligent railroad commissioners of the West ought to see remedied.

SCARCITY OF FREIGHT CARS.

Nearly all Western railroads would be doing a heavier freight business if they could get their cars returned quickly. Most railroads have enough cars for the freight they handle if they could have their cars kept moving, but as soon as a rush of business comes, great numbers of cars are converted into warehouses, and kept standing on sidetracks for weeks, while the owners are vainly shouting for the return of their property.

Several railroad officers I have talked with lately about the Western Railway Club were anxious to know if the meeting of railroad men there would do any thing toward facilitating the prompt return of cars. I certainly think it ought to. Cars are often delayed at transfer points by trifling misunderstandings that a few words exchanged by the parties most interested would clear away.

IDEAS OF ECONOMY GROWING.

I have noticed of late distinct indications all over the West of a growing desire among enginemen to compete with each other in trying who could run with the smallest expenditure of coal and oil. This is a new sentiment, and is certain to produce material reduction of expenses in the operating of the railroads where it ex sts. In master mechanics' offices, in round-houses, and on locomotives on the road I have lately heard so many accounts of performances made by men and locomotives that the awakening is unmistakable.

While waiting for a train at a junction the other day, I went into the cab of an engine, and got to chatting with the engineer. As soon as he knew that I understood something about locomotives, he began boasting about his engine; not, however, in the old way of telling how many cars she could pull over a certain hill, or how fast she could get out of a station. His theme was how many miles he could run to the ton of coal and pint of oil, and his fireman knew the extent of the performance to a fraction, showing that he, too, was interested. Among other points mentioned was the fact that, with sight-feed cups for the cylinders, he had used only 20 pints a month, against 50 and 60 used by men having ordinary boiler-head cups, and while making this record his steam-chest covers had not been off for a year.

One day that I was in a large roundhouse, I saw a crowd of men round the performance-sheet board, which was newly posted. They were all talking about what mileage they had made to the stores supplied, and several of them had note-books out checking the figures. They had evidently kept a record of the supplies received.

These incidents are very significant. The sentiment of economy is not found on all roads by any means, but where it is found the flag of progress is flying. Any thing that tends to hold men closely responsible for the way they do their work prevents waste. A master mechanic told me that he became convinced that the practice of men drawing oil without holding a record of it led to waste, so he had a stub-book made, and required every engineer to give a ticket for all oil he received. The performance sheet showed that this restrained waste of oil decidedly, and the same plan was adopted for coal with equally good results.

THE C. B. & Q. DYNAMOMETER CAR.

Through the kindness of the management and mechanical department of the Chicago, Burlington & Quincy Railroad, I have enjoyed the privilege of watching various tests made by the dynamometer car belonging to the company, and which was illustrated in the NATIONAL CAR AND LOCOMOTIVE BUILDER of February last. During a trip made on the St. Louis division, the matters under investigation were: The number of freight cars different classes of locomotives ought to pull over the heaviest grades; the effect on the tractive power of the engine of increasing the valve travel; the effect of inside lap on the economy and power of the engine.

On most roads there exist impressions among trainmen, and even among officers of the mechanical departments, that certain engines are more powerful than others of the same class and dimensions. The experiments with this dynamometer car clearly indicate that the difference in power does not exist, and that any apparent difference is due to the way a locomotive is handled.

Engine 366, with cylinders 17½ × 24 inches, and two pairs of driving-wheels 61 inches diameter, connected, total weight of engine 76,000 pounds, with loaded tender weighing 60,000 pounds, started from East St. Louis with a train of 20 freight cars, the dynamometer car and way car, the whole weighing 994,320 pounds. In starting from a station on the level, the dynamometer would register at times a tension over 16,000 pounds, but that would last only for a few seconds, when the engine was putting its whole power into starting or in accelerating the speed of the train. To keep the train running at a uniform speed of eighteen miles an hour on the level, a draw-bar tension of 3,500 pounds was exerted, or 7⅞ pounds to the ton.

In several places the grades proved too steep for the power of the engine, and she stalled while doing her best. When the engine was pulling in full gear, with steam at the popping pressure of 140 pounds to the square inch, the draw-bar would record a steady tension of about 15,000 pounds. The train would move steadily along, losing speed till a pace of about four miles an hour was reached, when the pull on the draw-bar would become irregular, the recording pencil fluctuating up and down. This would be due to the engine tending to hold its speed at the points of the stroke where the greatest power was exerted. Mr. Philip Wallis, the engineer of tests, said that when this irregular motion begins an engine is nearly at its last gasp, and his words proved true in every instance.

Indicator diagrams were taken from the engine at regular intervals, and electric connection with the recording sheet in the dynamometer car showed when each card was taken.

I shall have more to say on the result of these tests in a future issue.

WABASH SHOPS AT SPRINGFIELD.

During a recent visit to these shops, I found they were very busy, mostly with repair work. They have got seven engines in the machine shop, most of them getting heavy repairs, especially in boiler work. The dry summer has been particularly hard on Western roads that have to use lime-impregnated water, for the surface water has been scarce, and consequently a greater proportion of well water had to be used. The Wabash is by no means the only road that has been forced to do heavy boiler work this season.

Some engines in the shop are getting new boilers, new cylinders and new driving-wheels. The company have a good many small engines, with cylinders under 17 inches, that have wheels 5½ feet diameter and over. Such engines are almost useless with the heavy trains of to-day, and Mr. Barnes is putting smaller wheels under the engines, so that they may be put to service that will wear them out.

The shops are old, have grown large by degrees, and consequently are inconvenient for handling work cheaply. They have some good tools, but many of them are antiquated. They built seven new engines last year and are getting out material for five more. At present 275 men are employed in the shops.

They are putting the Barnes extension front and smoke-preventing device on all engines that pass through the shop. Engines thus equipped are making remarkable records for economy of fuel. One engine, No. 1,200, that pulls the Quincy passenger train, consisting of five cars, has month after month made between 70 and 80 miles to the ton of coal. The engine has cylinders 17 × 24 inches and the boiler has 1,220 square feet of heating surface, 118 square feet being in the fire-box. This gives 2·68 square feet of heating surface to the square inch of piston area, a proportion which ought to answer very well for Illinois coal.

C., B. & Q. LOCOMOTIVE SHOPS AT AURORA, ILL.

The machine shops here are old and inconvenient, but the ingenuity of the men in charge has done a great deal to overcome natural disadvantages and supply the means of getting work done economically. The work on hand is entirely in the way of repairs, but some of it is quite heavy. They are doing considerable work for the Chicago, Burlington & Northern road. Connected with the shop there is a very good tool room, which has a full equipment of standard small tools kept in good order and held to the proper size by the most approved test gauges. They have also templates with hardened bushes for the principal parts of their standard engines. Besides good small tools and accurate templates, they have numerous jigs and special attachments to machine tools for saving labor or for promoting accuracy of machine finish. They make excellent use of horizontal emery wheels running on arbors that pass through and rest above a cast-iron table. Among the work finished here, is the inside face of expansion links, a movable jig keeping the work to the proper radius. I have often seen the outside portions of links finished on emery wheels, but this was the first instance I had seen of the inside being finished in the same way.

With a special tool held on the arbor of a Brown & Sharpe milling machine, they turn globular surfaces, such as the outside of injector check valves. The tool can be adjusted to turn any size of globe that the table will hold.

They put an attachment on a radial drill for milling out the steam chest parts, and for doing other work of a similar nature. A heavy jig is used for holding the driving boxes on the table of the boring mill, the device being so arranged that the box can be adjusted in an instant. But the most important special tool is a sort of radial tool-holder for planing the inside of the driving boxes. Instead of slotting these boxes, 32 of them are stretched together on a long planer, and this tool does the work better than any slotter, and in half the time. The feed can be adjusted from $\frac{1}{32}$ to $\frac{1}{4}$ inch.

The mechanical department have adopted solid-ended channel-section side rods for all new work, and the officers speak highly of the service given by this form. The rods are forged to size, and then the ends are planed. The pin holes are then laid out by a heavy template, which is made the exact size of the rod. A small hole is then drilled in the centers, which is used to guide the tool which bores the hole to size. For this purpose a plain cutter, held in a steel bar, is used, the same kind of tool that is used in many shops for drilling the holes in flue sheets. The bushes are pushed into the rods with a small vertical hydraulic press, which is operated by a pump driven by a crank connected with the shop shafting. A similar press, but a little heavier, is used in the boiler shop for straightening sheets and other purposes.

They are using the Ross brake shoe for drivers on several locomotives belonging to this road. The shoe in question is so formed that the rubbing part is impressed upon the wheel flange and upon the portion of the tire outside the usual tread. The tendency is to wear down the parts that have to be turned down when wheels are sent to the shop. One set of these shoes that has been in use on this road for about a year is said to have reduced the necessity for turning tires about 50 per cent. The company have lately made a change in the pattern of the shoe to make the pressure more central.

They are putting a new overhead iron carrying crane into the boiler shop; also a pneumatic riveting machine of the Allen type. Air for operating the machine will be compressed by an Allen air compressor. The boiler shop is small, but the tools are so good and so compactly arranged that a great deal of work can be turned out.

Among other attractions that I saw during an hour's walk round the shop was a device for attaching air brake hose to the connections. With this appliance 40 hose can be put on to the attachment and clamped firmly in place by one man in one hour. They are using a whistle with a valve set horizontally in such a way that it can be removed for grinding without disturbing the whistle. The Jerome packing is used exclusively for piston rods and gives entire satisfaction. They are putting in a battery of six new boilers built at the shops for supplying the locomotive portion of the shops with steam.

CAR SHOPS.

The car shops at Aurora are very well designed for handling work. The buildings are wide, oblong shops set parallel, with transfers between each building. The planing mill and car-machine shop are at the eastern end, and stand at right angles to the other buildings. Rough wood and iron enter from the eastern end and keep moving westward as it gets finished. Still eastward of the planing mill is the yard for repairing freight cars. The work is done on three parallel tracks, and between two of them a narrow gauge track is laid, and is employed for moving the material used in doing the repairs. As the C., B. & Q. use iron trucks under their freight cars, there is considerable riveting and similar work to be done that requires the aid of a forge. To save the delay of taking the material to the blacksmith shop, a line of air pipe is laid alongside the repair tracks and small forges are connected thereto. In this yard I noticed some new cast-iron wheels which were conspicuous by being painted white inside. Stenciled on the paint were the words, "On trial. When worn out return to Aurora." From Mr. Johnson, the master mechanic, I learned that all new wheels of a make the company have not been using, are treated in this way. Before being put into service the wheels are dated and numbered, and when they are returned worn out or broken, their mileage record is examined and physical and laboratory tests made to ascertain the strength and nature of the iron.

Like most other Western car shops, these are quite busy with repair work, but they are also finding time and facilities for building some new cars. During the year, they have built 9 day coaches, 2 combination baggage, mail and passenger cars, 5 mail and baggage cars, and 5 baggage cars for the Chicago, Burlington & Northern, besides 2 dining and 3 suburban cars for themselves. They are now getting out material for the inside of one new dining car and one chair car. The latter is going to be furnished with Forney seats.

In the pattern shop I noted a practice well worthy of imitation. Like most other people handling many patterns, they have had frequent trouble from detached pieces being left out. They have now adopted the practice of painting the part Tuscan red where a loose piece has to be put on the pattern. When a molder is putting the pattern into the sand, a red mark will attract his attention if any small piece is left off. The cores they

paint yellow. Since this plan was adopted they have had no single instance of a detached piece being left out in molding.

The blacksmith shop connected with the car shops is well provided with formers and labor-saving machinery. They use a Williams & White forging machine to good advantage in pressing out draw-bar yokes, arch-bars, straps, ladder handles and all kinds of plain pieces. The whole of these shops are evidently run on the principle that the cheapest way of getting out work is to employ first-class men and use only the best of tools. A. S.

Rambles on British Railways.

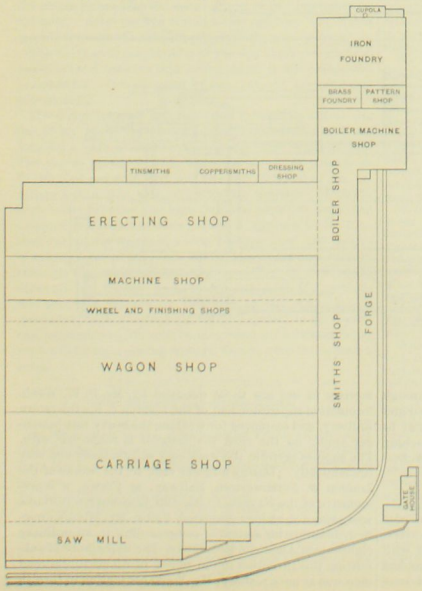
RAILWAY MACHINE SHOPS.

The machine shops which constitute the mechanical headquarters of British railways are nearly always complete manufacturing establishments, where not only locomotives and cars are built, but where every thing needed for use by the company, from a wood screw to the machinery of an interlocking switch tower, from a ticket punch to a steel rail, is made up from the raw material. Some American railroad companies follow the practice of building the greater part of their rolling stock, but in all cases where this is done, they purchase finished a considerable portion of the material used. Inside fittings of cars, screws, wheels, springs and rolled iron, are nearly always bought from firms making the manufacture of the article a specialty. The same thing is done with locomotives even to a greater extent, few railroad companies thinking it pays them to make their own injectors, safety-valves, oil cups, lubricators, springs, steel castings and other parts. In Britain a different policy is pursued. The railway companies aim to build all their rolling stock, and manufacture every part that belongs to their equipment. They strive to obtain the profits of manufactures in addition to what they receive as carriers of passengers and freight.

The business wisdom of the British practice is doubtful. When a manufacturer of an article is engaged in producing it in large quantities daily, special machinery, special methods and extraordinary skill are developed, and the cost of production is reduced to the lowest point. Where works produce only a limited quantity of any article, little attention is likely to be devoted to reducing the cost by special labor or time-saving appliances. A railway company is generally a big corporation, but few companies of that kind can keep a full plant busy on the manufacture of each article they use, so expensive machinery has to lie idle part of the time, and workmen have frequently to change their occupation. Elaborate division of labor and special machinery have been found economical in general manufacturing business, and there is no reason why railroad shops should be an exception.

In his admirable papers read before the American Society of Civil Engineers, Mr. E. B. Dorsey has proved that it costs about twice as much for an English locomotive to move one ton one mile as it does for an American locomotive to do the same work. I believe that owing to the peculiarities of its construction the English locomotive needs considerably more repairs for a given mileage than an American locomotive, but I am also under the impression that the system of each British railway maintaining an elaborate manufacturing establishment has something to do with the high cost of repairs.

THE CALEDONIAN RAILWAY SHOPS.



While staying in Glasgow, I made two visits to the shops of the Caledonian Railway at St. Rollox, and was kindly shown by Mr. Drummond and his assistants the whole of the establishment and the methods of doing work. The shops have recently been rebuilt and extended, and are by far the finest railway shops I have ever seen. The extent and plan of the work can be understood by an examination of the accompanying engraving. The various shops and departments are sub divisions of one huge single story building, which covers about twelve acres. It is inclosed by iron truss roofs supported by iron pillars and covered entirely by glass, making every part of the shop very light. Each roof spans about 40 feet, and each longitudinal space between the pillars is called a "bay." The first impression on entering the building was that the structure was slim for the size of roof carried, but that presently gave place to the conclusion that the parts were admirably proportioned to combine lightness with the necessary strength. The locomotive erecting shop, machine shop, carriage shop, wagon shop (freight car shop), and sawmill occupy the main building. The blacksmiths shop, boiler shop and forge shop are under the main roofs, but are divided from the other shops by a wall. Referring to the engraving it will be seen that the erecting shop occupies one side of the building, and has the machine shop between it and the carriage department. The erecting shop has not got the pits set at right angles to the line of the machine shop, as is the custom in America. The engines under repair stand on parallel tracks running the whole length of the shop, and material is moved to each engine on narrow gauge tracks passing between the common tracks. The shop has convenience for holding 100 locomotives. It is traversed by a 30-ton overhead crane, which is used to transport locomotives from place to place. The shops are well provided with smaller traveling and swing cranes, so that very little manual labor is expended in moving heavy weights.

The machine shop is particularly well provided with heavy tools. A slotting machine was at work on twelve of their slab frames. That tool has a bed 34 feet long, an opening of 4 feet between uprights, and 4 heads with a stroke of 20 inches. There are numerous large engine lathes and a driving wheel lathe that takes in driving wheels 8 feet diameter. There was one planer with a cutting area of $5 \times 5 \times 5 \times 20$ feet, and others of smaller capacity that would be regarded as large in many of our shops.

The work turned out is all supposed to be interchangeable, but the templates employed are much like those in use in America ten years ago. So far as I could see, the accuracy of production depended upon the accuracy of laying out. There were a few special tools, among which was conspicuous a cylinder-boring machine that bores the stuffing-boxes and faces the heads. A bush-boring machine did its work very rapidly, finishing about 28 bushes an hour. Several tools of American origin have found their way into these shops. There is a Westinghouse engine at work in the brass foundry driving molding machines for car brasses. In one shop I noticed two turret lathes that were made in Boston, and a Root blower supplies blast to the forge shop.

Work in the car department is carried on in a very systematic way, the rough material coming in at one end of the "sawmill," which is equivalent to our planing mill, and coming out at the other end ready for the car. All parts are made to standard sizes, and a door, a window, a buffer or a coupler belonging to one car will fit any other car of the same class without change. In this respect Mr. Drummond's car shop is ahead of the ordinary run of car building practice in America. The sawmill is, however, not nearly so well provided with woodworking tools as the planing mill of say the Chicago, Rock Island & Pacific Railway shops in Chicago, or of many others that might be named.

The blacksmith shop and forge shop arrangements struck me as being particularly good. The former is a fine, spacious, oblong "bay," 75×390 feet. There are 17 single fires at each side and the same number of double fires in the middle, plenty of room being left for swinging work around to the anvils. Each fire is covered by a neat hood, ending in a pipe which carries the smoke and gas to a large horizontal pipe that runs throughout the building. The forge shop is where the very heaviest forging and iron forming is done. It has a row of furnaces and numerous machines for facilitating the work.

These shops do the work of building and repairing the rolling stock and all other kinds of machinery used in operating 708 miles of track. About 2,200 men are employed in the works. In January of this year the company owned 690 locomotives, 1,660 carriages and 44,139 wagons (freight cars). They build annually about 40 new locomotives, 90 carriages and 2,000 wagons. A carriage weighs about 9 tons and carries 50 passengers. A goods wagon weighs about 5 tons and carries 8 tons.

NORTH LONDON ELEVATED RAILWAY.

Visitors to London usually assume that the underground railway system of rapid transit is the British equivalent of our Elevated Railroad system, and comparisons are usually made between the two methods of transporting passengers rapidly through crowded cities. Many writers think the underground system preferable in every way to our elevated structures. That was not my impression. The only advantage I can see that the tunnel has to the trestle, is that the former is out of sight and out of hearing. The first cost of constructing an underground railway is enormous; it has to be operated in the dark, and the gases from the locomotives are so stifling and annoying that they prevent many people from traveling on those roads.

It appears to me that the British elevated railway is in most respects a better means of rapid transit than the underground, and the British structure and methods of operating might be copied with advantage by American engineers and railroad managers. The most important elevated railway in Britain is the North London Railway. This line forms an arc round the north and east of London, and consists of 12 miles owned by the company, and 5 miles of leased track. On 5 miles of the most crowded part of the line there are four tracks. The greater portion of the road is built on substantial brick arches on a right of way that was purchased by the company. The arches are leased as storehouses, and the rent brings considerable revenue to the owners. The structure is permanent, can carry practically any load, and requires very little repair after being finished—features possessed by no elevated railroad in America except that portion of the Pennsylvania passing through Philadelphia. The North London Railway carries both passengers and freight, the greater part of the latter business being done at night. They carried about 37 millions of passengers last year, the fare from each person being close on 4 cents. The passengers are charged according to the distance traveled, a plan followed on all suburban and street car roads on the other side. The road carried close on 2,500,000 tons of freight last year, and handled 745,721 live stock animals.

A system similar to this freight-carrying is urgently needed in connection with the suburban traffic of American cities, and the need will every year become more pressing. Any observant person who has watched the daily jam of vehicles that overcrowd the streets of New York in carrying the supplies for household consumption from the markets and warehouses down town to the distributing points in the residence districts, can readily appreciate the advantage it would be to have the supplies brought to the distributing points by the elevated railroads. That service to the people of the British metropolis is performed by the North London Railway. The company have docks where ships and barges bring in large quantities of freight, which is quickly transported by trains to the different warehouses, and the company have "running powers" over 97 miles of track belonging to other companies, which are used for increasing their carrying business.

These particulars and other favors I received from Mr. G. Bolland Newton, General Manager of the North London Railway Company.

NORTH LONDON RAILWAY SHOPS.

The greater part of the rolling stock belonging to the North London Railway is built and repaired at the company's shops at Bow, but the material used is not worked up from the raw state. The shops are in many respects like the better class to be found in America, and the methods of doing work have many American peculiarities which are due to the locomotive superintendent, Mr. John C. Park having spent several years on a Canadian railway.

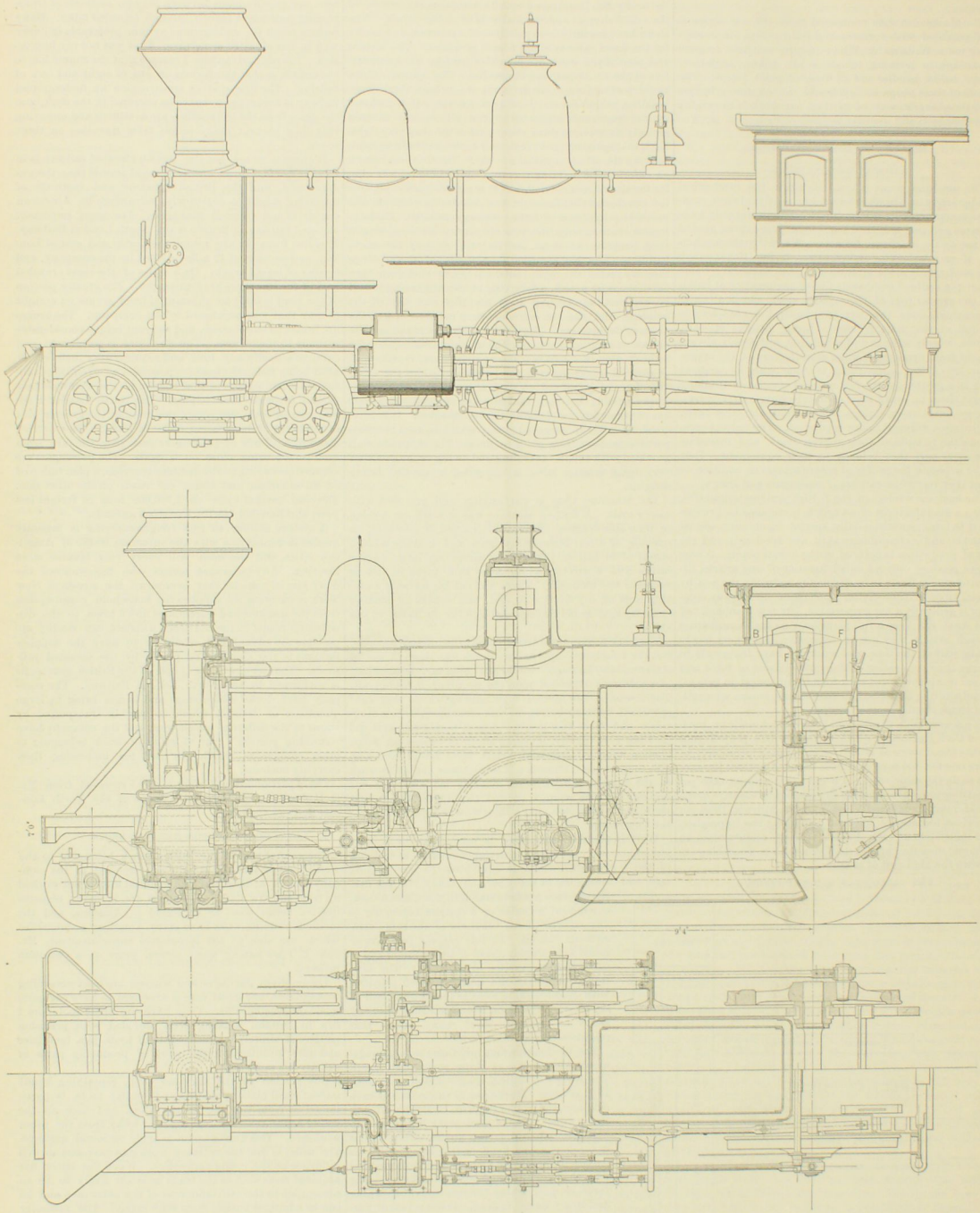
Locomotives, carriages and wagons are built according to standards, and great care is exercised to have the parts made interchangeable. They have the finest tool room I saw in Britain, it being well provided with precision gauges, accurately maintained small tools, jigs, templates and other auxiliaries to the work of producing parts of exactly the same size.

One portion of the machine shop, containing small lathes, small planers, shapers and similar tools, is partitioned off from the rest of the shop, and here all the young apprentices are kept together away from the other workmen. This arrangement is made on moral grounds. The belief is that the ordinary workman exercises an evil influence on the young apprentice. When the latter has acquired some skill in the trade he is not likely to be so susceptible to the evil influences of the older men and he can be admitted among them with safety. The necessity for the adoption of this separation plan is not creditable to the moral condition of the British mechanic.

Milling machines and special machines for particular operations are made good use of in this shop. There is a heavy milling machine, evidently designed specially for cylinder work and used to good purpose in milling valve seats, frame faces and other parts about the cylinder that have to be tool-finished. Most of the engines have outside cylinders, which are connected together by heavy wrought iron girders. This job seemed very substantial, but I would prefer a sound casting.

They use a template to guide the tool which cuts the tube plate holes. The tube plates are of steel, $\frac{7}{8}$ inch thick, which is an innovation, as copper is generally used for all parts of the fire-box. Mr. Park is very favorably disposed

COMPOUNDED EXPRESS LOCOMOTIVE—GRAND TRUNK RAILWAY.



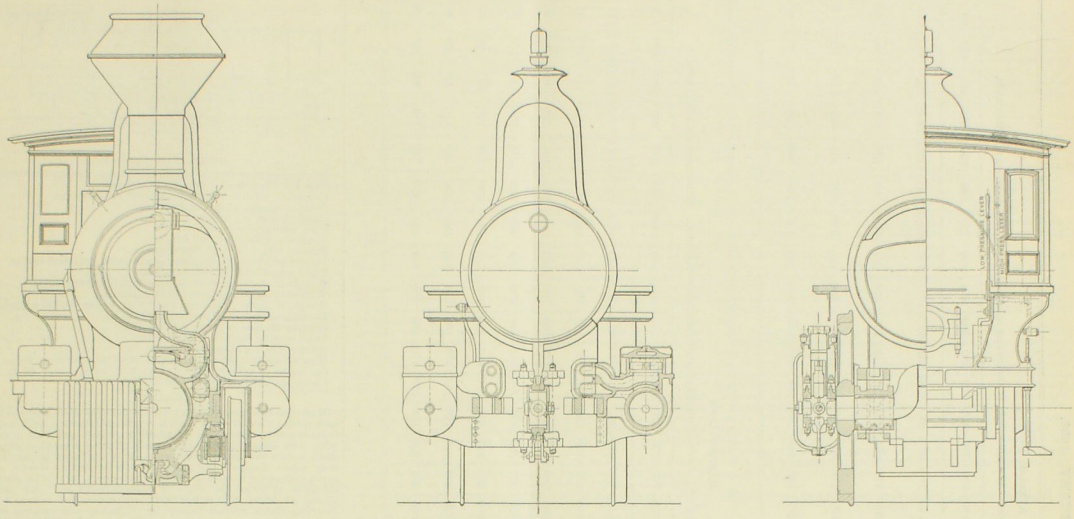
toward trying steel sheets for fire-boxes, and he does not understand why steel can not be used as successfully in his locomotives as it is in American engines. I noticed he puts two rows of rivets in the mud ring of his fire-boxes.

Like most British shops, this one is well provided with the means of handling heavy pieces and for moving material around. In the boiler shop there is a very useful and inexpensive jib crane that travels along the shop on a single rail.

In connection with the shops a museum is kept containing parts of machinery that have broken, with records of the conditions under which the breakages occurred. Mr. Park says that this department has provided them with very useful information. Where a breakage occurs through weakness or fault of design, the defect is remedied and new developments looked for. The lessons that may be learned from breakages ought to effect a wider teaching than they generally do. A. S.

Compounded Express Locomotive.

Although practically nothing has been done in America in applying the principle of compounding to locomotives, most of our railroad mechanical men are familiar with what has been done in Europe in working out this problem of heat economy. The most celebrated compound locomotives in use are those designed by Mr. F. W. Webb, locomotive superintendent of the London & Northwestern Railway, and employed for working the heavy fast passenger traffic on the road the designer is connected with. The engines perform the work very satisfactorily and very economically. During a recent visit to the works of the London & Northwestern Railway, at Crewe, a representative of the NATIONAL CAR AND LOCOMOTIVE BUILDER was shown drawings prepared under Mr. Webb's direction, adapting his system of compounding to an ordinary eight-wheel American locomotive. The importance of submitting this invention to the notice of American railroad men was at once realized, Mr. Webb consenting to furnish



us with copies of the drawings. The accompany cuts were made from them.

An examination of the engravings will show that the American eight-wheel locomotive can be compounded with very few changes. In the system of compounding invented and patented by Mr. Webb, three cylinders are employed. Two high-pressure cylinders are located outside the frames, and a single low-pressure cylinder placed under the smoke-box. The high-pressure cylinders in the engine under notice are placed outside the frames behind the truck. The arrangement of crossheads, guides and other connections can be understood very readily by the cuts. Power is transmitted from the high-pressure cylinders to the back driving wheels, the cranks being set at right angles as in the ordinary engine. The low-pressure cylinder transmits power to the forward pair of driving wheels, and connects to a crank in the middle of the axle. In this engine the high-pressure cylinders are 14 × 24 inches, and the low-pressure cylinder 30 × 24 inches. The working of the engines is in the following way: Steam passes from the boiler through the dry pipe to the smoke-box, where the ordinary branch pipes convey it to the steam chests of the high-pressure cylinders. Here it does a certain amount of work which is regulated by the point of cut-off, and is then exhausted into pipes in the smoke-box that act the part of intermediate receiver and superheater. After getting slightly heated in this receiver the steam passes into the steam chest of the low-pressure cylinder. After passing through this cylinder the steam escapes through the exhaust pipe into the smoke-stack.

The valve gear employed is of the Joy type, which possesses several features that recommend it for compound locomotives. It is operated by two reverse levers placed side by side.

The writer recently traveled from London to Crewe on one of Mr. Webb's latest compound locomotives, and she handled a train of eighteen carriages very comfortably. The engine steamed well, burning about 30 pounds of Welsh coal per mile, and was as easily handled as an ordinary locomotive, and gave no more trouble. With the high boiler pressure and high terminal pressure becoming common in American locomotives, it appears to be time that our master mechanics were looking into the means of taking some of the work out of the steam now thrown through the smoke-stacks. Compounding is growing in favor all over Europe, and a system that saves money there will soon find friends on this side of the Atlantic. It would cost little to adapt Mr. Webb's system to an American locomotive. We will be interested in watching what road will be enterprising enough first to give the system a trial.

The Freight Car Brake Tests.

At the request of the Westinghouse Brake Co., we copy from the *Railway Review* the following communication from Mr. L. S. Coffin, one of the Railroad Commissioners of Iowa:

To the Editor of the Railway Review:

I notice in the *Railway Review* of Aug. 28 a communication from "Observer" on the "brake tests" at Burlington, of which you ask my opinion. While I have no desire to enter into any newspaper discussion on this very important subject of "freight car brakes," neither will I be drawn into one, for the very obvious reason that such a discussion on my part would be utterly profitless to your readers, as I am not a practical railway man—still it may not be out of place for me to answer in my own simple way your question.

You well know why I attended so closely those series of tests. I wanted to satisfy myself of the fact—if it should appear to be a fact, of which I had not much doubt—of the practicability of applying automatic brakes to freight cars. I was and am anxious to see some way by which men can handle freight trains without being compelled to run such imminent risks to life and limb as now with the common hand brake.

I went to Burlington, hoping that this fact would be demonstrated beyond any peradventure. I cared not one fig which brake did this—still, if anything, I went there prejudiced against the air brakes, because of their expense, and hoping some cheaper brake would show, if not a superior, at least an equal merit, so as to be all the more readily adopted by all roads, even by the most impecunious, because of their cheapness.

All these hopes I confess were very soon "bumped" and "jerked" out of me while riding in the rear car, to learn by actual experience what their workings were.

No farmer in Iowa would, if he had experienced what I did, wish to send his steers or his hogs to Chicago on trains equipped with either of the buffer brakes tested there. As a friend to the trainmen I could never consent to the adoption of either of them by the railroads of this State.

The matter simply resolved itself to this: Air brakes or none—as far as automatic or power action is concerned—or at least in the present acquired knowledge of applying the buffer brake principle. I am sorry to admit this, but stern facts there developed compel it.

I don't know as I should attempt to answer "Observer's" article, yet, if at all, until I could see his promised "further observations." Still, if he should see my homely, plain criticism of it, he may in his further remarks adapt them to my unpracticed mind, so I can the better understand them.

For many years I have been connected with the management of our State fair. I have often listened to the remarks of exhibitors, especially of stock, when some other one had taken the ribbons, and been amused at what they "could have done," had they known their competitors would have had their stock thus and so. For a whole year they had had notice that at such a time there would be called into the show ring the conflicting herds, and they ought to have known that each competitor would do his best to have his herd in the finest possible condition for the show. It was too late after the awards were made to tell what "might have been."

Without attempting to decide one way or the other as to the merits or demerits of the Eames or the Westinghouse brakes, it may be proper for me to say that the communication of "Observer" seems to me a sort of special pleading. If the Eames brake was not there in its best condition possible, whose fault was it? For two years this test had been in contemplation. Everybody had a right to conclude it was to be a sort of trial for the "survival of the fittest." To any unskilled railway man like myself, the conclusion was natural that each would come there prepared to do his best.

What I saw and experienced of the actual workings of each in all that three weeks of knocking back and forth in that rear car is a thousandfold more potent in forming my judgment of the value of either than volumes of "Observer's" pleadings and showings of "what might have been."

That the tests were conductued in the most fair and exhaustive way, no man of candor who witnessed them will deny. All railway men, as well as shippers of stock and freight that requires rapid and careful handling, are under obligations difficult to repay to Mr. Rhodes and his committee. They have rendered a service to the whole country that will be marked as one of the most prominent and essential mile-stones in the progress of railway improvement, and as second to none in the last quarter of a century. While I have a full heart of sympathy for those earnest, able and sincere gentlemen who met with disappointment at that test—yet the vast importance of wisely deciding on the right brake so far outreaches any private loss, and the good that is possible to come to the hundreds of thousands of trainmen is so great, that this private loss and disappointment is more than compensated in the contemplated good to result.

To my mind it would be a very unfortunate thing for the railways to decide upon a plurality of brakes, even if their merits were nearly equal, especially if they required different action and training by the engine men. There must always be an element of danger in changing from one to the other. Life is too sacred a thing to be put in the balance with the few dollars a man or company of men may make or lose by the adoption or rejection of any specific brake.

When the committee makes its final report it may become my duty as a commissioner for this State to urge the passage of a law requiring our railways to adopt the one recommended as the best by that committee. This to my view would be the logically practical outcome of the tests. If it were not to learn which was the best, and, when learned, to adopt it, the great outlay to make the tests would be money thrown away.

Again, let me say I am not attempting to decide between the Eames and the Westinghouse brakes—I am trying to explain how the communication of "Observer" strikes me. I cannot say how his criticism or explanations may strike a railroad man familiar with the technical terms used by him, but to an outsider, a life-long farmer, it does seem to me that his very pleadings hurt the cause he advocates. All that we outsiders know at present is that the air brakes proved themselves as the only ones worthy of serious consideration at that test. If any one thing was conclusively proved there above another, it was this, viz.: That whatever was to be the brake of the future, that brake must be under the complete and absolute control of the engineer. The air brakes are so controlled—and no others. Now, which of these air brakes is to be the one, I am not a proper person to decide. The communication of "Observer" would not help me to decide in favor of the Eames. On the contrary, it has suggested, for the first time, very serious doubts in regard to it. It strikes me as being an attempt to bolster it up before the committee, as though it was not safe to let it stand on its own revealed merits. Here, then, you have my opinion. As to which brake is the coming one, I will wait the final action of the committee, in whose judgment I place great confidence.

Allow me here to express my great obligations to every member of that committee, and especially its chairman, for their marked courtesy in giving me every facility to watch the workings of the tests.

Respectfully, L. S. COFFIN.

Increasing the Valve Travel.

A tendency is apparent of late among designers of locomotives to increase the throw of eccentrics and the travel of the valve. Only a few years ago 4½ inches eccentric throw, and the same valve travel, were common and favorite dimensions. Last month we mentioned that Mr. Soule, of the Erie, was trying an eccentric throw and valve travel of 6 inches on some new engines under construction. Since then we have ascertained that several roads have adopted an eccentric throw of 5½ inches for all their passenger locomotives. In early designs of link motion, the slip of the link block was made out to be a great evil that must be reduced by every possible means to its lowest possible limits. To lessen the slip, many motions were designed with short eccentric throw. Experience has, however, proved that a little slip is not so objectionable as the restricted valve opening entailed at short points of cut-off by a very limited valve travel. Besides giving a better opening at short points of cut-off, a valve motion with a fairly long valve travel is easier kept approximately square than a short throw valve, when the working parts get worn.

TRAIN RESISTANCE ON GRADES, NORTHERN PACIFIC RAILROAD, FEBRUARY, 1886.

AVERAGE DUTY

On grades on tangents at a speed of 10 miles per hour. Average weight of engine and tender deducted. Steam pressure, 135 pounds.

Cylinders.	Wheels.	Tractive power in pounds for each pound of effective pressure.	Number of pairs of drivers.	Weight on drivers, in pounds.	Total weight of engine, pounds.	Weight of tender, loaded, pounds.	Total weight of engine and tender, pounds.	Grade in feet per mile.....	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	350	400	450	500
								Total resistance in pounds per ton at 10 miles per hour.....	35.5	29.3	33.1	36.9	40.6	44.4	48.2	52	55.8	59.6	63.4	67.2	70.9	74.7	78.5	82.3	86.1	89.9	93.7	97.4	101.2	105	108.8	112.6	116.4	120.2	139.1	157.7	176.5
22" × 26"	49"	356.8	4	100,000	112,000	65,000	177,000	Tractive power in tons hauled with cut-off at half stroke. M. E. P., 112 lbs.....	1,040	893	781	691	620	559	508	465	427	394	365	340	317	297	278	261	246	231	218	207	196	185	176	167	159	151	118	94	74	58
22" × 26"	49"	356.8	5	110,000	112,000	65,000	177,000	Tractive power in tons hauled with cut-off at half stroke. M. E. P., 112 lbs.....	1,040	893	781	691	620	559	508	465	427	394	365	340	317	297	278	261	246	231	218	207	196	185	176	167	159	151	118	94	74	58
20" × 24"	49"	196	4	88,000	108,060	65,000	173,000	Tractive power in tons hauled with cut-off at half stroke. M. E. P., 112 lbs.....	774	663	578	508	454	408	346	336	307	281	260	240	222	207	193	180	168	158	148	139	130	122	115	108	102	98	71	53	37	26

MAXIMUM DUTY

On grades on tangents for short distances at 10 miles per hour. Average weight of engine and tender deducted. Steam pressure 135 pounds

Cylinders.	Wheels.	Tractive power in pounds for each pound of effective pressure.	Number of pairs of drivers.	Weight on drivers, in pounds.	Total weight of engine, pounds.	Weight of tender, loaded, pounds.	Total weight of engine and tender, pounds.	Grade in feet per mile.....	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	350	400	450	500
								Total resistance in pounds per ton at 10 miles per hour.....	35.5	29.3	33.1	36.9	40.6	44.4	48.2	52	55.8	59.6	63.4	67.2	70.9	74.7	78.5	82.3	86.1	89.9	93.7	97.4	101.2	105	108.8	112.6	116.4	120.2	139.1	157.7	176.5
22" × 26"	49"	356.8	4	100,000	112,000	65,000	177,000	Maximum tractive capacity. Cut-off at 70 p. c. M. E. P., 137.5 lbs.	1,196	1,026	901	799	718	649	591	541	498	461	428	399	373	350	329	309	292	276	261	248	235	223	212	202	193	184	147	119	97	79
								Maximum adhesive capacity. Cut-off at 9.9". M. E. P., 97.3 lbs.	892	765	667	589	537	470	432	391	360	331	305	284	265	246	229	215	202	190	178	168	158	150	140	134	126	119	91	70	53	39
22" × 26"	49"	356.8	5	110,000	112,000	65,000	177,000	Maximum tractive capacity. Cut-off at 70 p. c. M. E. P., 137.5 lbs.	1,196	1,026	901	799	718	649	591	541	498	461	428	399	373	350	329	309	292	276	261	248	235	223	212	202	193	184	147	119	97	79
								Maximum adhesive capacity. Cut-off at 11.8". M. E. P., 107 lbs....	989	850	742	657	589	531	484	440	404	373	347	322	299	280	262	247	231	217	205	194	183	173	164	156	148	140	116	86	67	52
20" × 24"	49"	196	4	88,000	108,000	65,000	173,000	Maximum tractive capacity. Cut-off at 70 p. c. M. E. P., 137.5 lbs.	898	744	649	573	513	461	418	381	349	322	297	276	257	239	223	210	196	184	173	163	154	145	137	130	123	116	88	68	51	38
								Maximum adhesive capacity. Cut-off at 15.5". M. E. P., 122 lbs....	855	726	639	564	505	454	411	375	342	316	295	275	262	245	232	221	210	202	192	185	179	170	160	150	142	134	127	120	113	86	65	49	36

Tractive force due adhesion is taken as equal to one-fourth adhesive weight.

"Decapod" Freight Locomotive, Northern Pacific Railroad.

GENERAL DESCRIPTION.

Decapod pattern freight locomotive engine, having ten coupled wheels and two-wheeled swing bolster truck.
Cylinders, 22 inches diameter and 26 inches stroke.
Driving-wheels, 45 inches diameter.
Gauge, 4 feet 8½ inches.
Fuel, bituminous coal.
Total wheel-base, 24 feet 4 inches.
Driving wheel-base, 17 feet 0 inches.
Total wheel-base of locomotive and tender, 48 feet 0 inches.
Rigid wheel-base, 12 feet 8 inches.
Weight in working order, total, about 156,000 pounds.
Weight on drivers, about 140,000 pounds.
Weight of tender, with fuel and water, about 75,000 pounds.
Heating surface of of fire-box, 162 sq. ft.
Heating surface of tubes, 2,148 sq. ft.
Total heating surface, 2,310 sq. ft.
Area of flue openings, 848 sq. in.
Heating surface per sq. inch of cylinder area, 3.03 sq. ft.
Sq. inches of cylinder area to 1 sq. inch flue opening, .89 sq. in.
Steam pressure-standard, 140 pounds.

BOILER.

Made throughout of flange plates of homogeneous cast steel ⅝ inch thick; riveted with 1-inch rivets placed not over 3 inches from center to center; all longitudinal seams and butt seams, with welt strips, inside and outside, double riveted. Throat sheet ⅜ inch thicker than shell of boiler to prevent undue thinning where flanged. All parts well and thoroughly stayed, and extra welt-pieces riveted to inside of side-sheet, providing double thickness of metal for studs of expansion-braces. All plates planed at edges and caulked with round-pointed calking-tool, insuring plates against injury by chipping and caulking with sharp-edged tools. Boiler tested with hot water to 180 pounds pressure per square inch.

Waist 68 inches in diameter at smoke-box end; made straight top and with one dome placed centrally on waist; mud drum under waist in front.

Tubes of lap-welded charcoal iron, No. 12 wire gauge, with copper ferrules on fire-box ends, 270 in number, 2¼ inches in diameter and 13 ft. 6 in. in length.

Fire-box 121 inches long and 42 inches wide inside, of homogeneous cast steel; all plates thoroughly annealed after flanging; side and back sheets ⅜ inch thick, crown sheet ⅜ inch thick; flue sheet ½ inch thick.

Water space 3 inches sides and back, 4 inches at front. Stay-bolts ⅝ inch diameter; screwed and riveted to sheet, and not over 4½ inches from center to center. Fire-door opening formed by flanging and riveting together the inner and outer sheets.

Crown sheet supported by crown bars each made of two pieces of wrought iron, 6½ inches by ⅝ inch, set 1½ inches above crown, placed not over 4½ inches from center to center, and bearing on side sheets.

Crown bar bolts to have round head with washer plate between head and crown bar, bolt to pass through washer plate, crown bar, thimble and sheet, and be riveted over on underside of crown sheet.

Crown stayed by braces to outside shell of boiler.

Cleaning plugs in corners of fire-box, and blow-off cock in side or back.

Balanced poppet throttle-valve of cast iron, in vertical arm of dry-pipe.

Grates, rocking, company's style.

Ash-pan with double dampers.

Smoke-stack, straight style.

Smoke-box, extended, with netting, deflecting plate and spark ejector.

FRAMES.

Main frames of best hammered iron, made in two sections. Main frames forged solid.

Front rails bolted and keyed to main frames, and with front and back lugs forged on for cylinder connections.

Pedestals protected from wear of boxes by cast-iron gibs and wedges. Pedestal caps lugged and bolted to bottom of pedestals.

ENGINE TRUCK.

Center-bearing swiveling, two-wheeled truck with swinging bolster and radius bar

Truck frame and braces of wrought iron, fitted with cast-iron swinging bolster. Pedestals of cast iron.

Two steel-tired wheels of approved make, 30 inches diameter.

Axles of hammered iron, with journals 5 inches diameter and 9 inches long.

Springs of cast steel tempered in oil, connected by equalizing beams resting on tops of boxes.

MACHINERY.

Cylinders of close-grained iron as hard as can be worked; each cylinder cast in one piece with half saddle, placed horizontally; right and left hand cylinders reversible and interchangeable; accurately planed, fitted and bolted together in the most approved manner.

Valve face and steam chest seat raised above face of cylinder to allow for wear. Cylinders oiled by Nathan & Dreyfus sight-feed lubricators placed in cab, and connected to steam chests by pipes running under jacket. Pipes proved to 200 pounds pressure.

Pistons of cast steel fitted with company's pattern steam packing. Piston rods of steel, ground and keyed to cross-heads, and secured to piston by a nut; piston rod riveted over outside of nut, company's style.

Guides of steel fitted to wrought iron guide yoke.

Cross-heads of best cast steel, "Laird's" pattern, with Babbited bearings.

Valve motion, most approved shifting link motion, graduated to cut off equally at all points of stroke. Links, sliding blocks, pins, lifting links, and eccentric rod jaws made of best hammered iron, well case-hardened. Sliding blocks with long flanges to give increased wearing surface. Rock shaft and reverse shaft of wrought iron.

Driving wheels, ten in number, 45 inches in diameter. Centers of cast-iron turned to 39 inches to receive tires.

Tires, of best Krupp's crucible cast steel, 3 inches thick when finished; 1st, 4th and 5th pairs flanged, 5½ inches wide; 2d and 3d pairs plain, 6¾ inches wide.

Axles of hammered iron; journals 8 inches diameter, 9 inches long.

Driving boxes of cast iron, with brass bearings, Babbitted.

Springs of cast steel, tempered in oil. Equalizing beams of wrought iron and of most approved arrangement, with steel gibs and keys.

Connecting and parallel rods of hammered iron, forged solid, furnished with all necessary straps, keys and brasses.

Oil cups. Nathan & Dreyfus needle oil-cups on rods and guides.

Lubrication of all bearings carefully provided for, and oil cups attached where required.

Wrist-pins of steel.

Feed-water supplied by two approved injectors, No. 9 Monitor on right side, and No. 9 W., non-lifting, on left side.

ACCESSORIES.

Cab. Substantially built of clear, sound ash, well finished, and fitted together with joint bolts and corner plates.

To be provided with suitable windows and doors, conveniently arranged, and glazed with first quality double American crystal glass.

Pilot. Of wood, braced with iron.

Engine to be furnished with one sand-box, stand for headlamp, bell, whistle, heater, blower and safety-valves, steam-gauge, cab-lamp, gauge-cocks; also a complete set of tools, consisting of two heavy jack-screws and levers, one heavy pinch-bar with steel point and heel, one monkey-wrench, a complete set of wrenches for all nuts and bolts on the engine, one set of driving-box packing tools, one packing hook, one machinist's hammer, one soft hammer, three cold chisels (two flat and one cape), one long spout quart oil-can, one two-gallon oil-can, one tallow-pot, engineer's torch and arm rest, one extra fusible plug, one bell cord, two cab seats, two cab seat cushions, one poker, one scraper, one slice-bar and one scoop shovel.

Head light, with 23-inch reflector.

Air brake. Westinghouse automatic brake on four pairs of driving wheels, tender and train, and Le Chatelier water brake.

FINISH.

Cylinders lagged with wood or asbestos and neatly cased with iron, painted. Cylinder head covers of cast iron, painted. Steam chests with cast iron tops, bodies cased with iron, painted. Dome lagged with wood, with iron painted casing on body, and cast iron top and bottom rings.

Hand rails of iron. Running board nosings of angle-iron. Wheel cover nosings of iron. Boiler lagged with wood, neatly jacketed and secured by brass bands.

Engine and tender to be handsomely painted and varnished. Lettering and number to be as specified by purchaser.

GENERAL FEATURES OF CONSTRUCTION.

All principal parts of engine accurately fitted to gauges and templates, and thoroughly interchangeable.

All finished movable nuts and all wearing surfaces of machinery made of iron case-hardened.

All wearing brasses made of ingot copper and tin, alloyed in the proportion of five parts of the former to one of the latter.

All threads on bolts to United States standard.

TENDER.

Tank strongly put together with angle-iron corners and well braced. Top, inside and bottom plates of ¼-inch iron; outside plates of ⅜-inch iron; riveted with ⅜-inch rivets; one and one-quarter inches pitch.

Capacity, 3,600 gallons.

Tender frame substantially built of oak, strongly braced.

Two four-wheeled center-bearing trucks, made with square wrought-iron frames and heavy equalizing bars; additional bearings at sides of back trucks. Springs of best cast steel tempered in oil.

Steel-tired wheels 33 inches diameter, of approved make. Brakes on both tender trucks.

Axles of best hammered iron; outside journals 3⅜ inches diameter and 7 inches long. Oil-tight boxes with brass bearings. M. C. B. standard axle (4¼ inches diameter at center), brass and key.

Two tool boxes of hard wood, bound with iron and fitted with locks and keys.

All patent fees not covered by this specification excepted.

PHYSICAL TESTS OF MATERIALS.

All material used in the construction of the locomotive shall be of the best quality of their respective kinds, carefully inspected and subjected to the following tests. Notwithstanding these tests, should any defect be developed in working, the corresponding part will be rejected.

All boiler iron will be specified C. H. No. 1 Flange quality, and must be made from the best charcoal blooms.

In every boiler one sheet will be ordered 3 inches longer than the size required, from which a strip will be cut and tested. The pieces so tested must have an ultimate tensile strength with the grain of not less than 50,000 pounds, an ultimate tensile strength across the grain of not less than 45,000 pounds, and must shew a ductility, measured by elongation or reduction of area, of not less than 20 per cent. Should any of the test pieces fail to fulfill the above requirements, the entire boiler may be rejected. Should any plates develop defects in working, they will be rejected.

Each plate must be stamped with maker's name and guaranteed tensile strength and elongation as above.

A careful examination will be made of every sheet and plate, and none will be accepted that show mechanical defects.

A test strip from each sheet, taken lengthwise of the sheet and without annealing, should have a tensile strength of 55,000 pounds per square inch, and an elongation of 30 per cent. in section originally 2 inches long.

Sheets will not be accepted if the test shows a tensile strength less than 50,000 pounds, or greater than 65,000 pounds per square inch, nor if the elongation falls below 25 per cent. Should any sheets develop defects in working, they will be rejected.

Manufacturers must send one test strip for each sheet (this strip must accompany the sheet in every case), both sheet and strip being properly stamped with the marks designated in our order, and also lettered with white lead to facilitate matching.

Iron or steel for stay-bolts and crown stays must have an ultimate tensile strength of not more than 60,000 pounds, nor less than 48,000 pounds per square inch, with an elongation of not less than 20 per cent., nor undergo a reduction of area of fractured section of more than 35 per cent. It must also stand this test:

A piece of iron or steel from 18 inches to 24 inches in length is to have one end fastened in a vise; over the other end a piece of pipe is to be passed to within 6 inches of the vise. By means of the pipe the sample must be bent until the end is at right angles to the portion in the vise and then bent back to its original position. This must be repeated not less than twelve times without showing fracture, the bending being each time in the opposite direction to that previous.

All boiler tubes must be carefully inspected and be free from pit-holes or other imperfections. Each tube must be subjected to an internal hydraulic pressure of not less than 500 pounds per sq. inch by the manufacturers before delivery. They must be rolled accurately to the gauge furnished by the Northern Pacific Railroad Co., filling the gauge to a plump fit. They must be expanded in the boiler without crack or flaw.

When tested, iron and steel tubes must show a tensile strength of not less than 55,000 pounds per square inch, and a ductility of not less than 15 per cent.

Tubes of brass or copper to be of uniform circumferential thickness and solid drawn; to be perfectly round, and to resist an internal hydraulic pressure of 300 pounds per square inch. From the tubes under test, a piece 4 inches long will be cut, annealed, sawn lengthwise, and doubled inside out without showing sign of cracks.

When annealed, they must withstand flanging cold a flange ⅝ inch broad for 2-inch tubes without cracking. Copper tubes must withstand flanging hot as well as cold. Tubes other sizes than 2 inches diameter must flange to a width proportional to their diameter.

A piece 30 inches long, annealed and filled with rosin, must withstand being doubled until the extremities touch each other without showing defects.

A piece 30 inches long, not annealed, filled with rosin, and placed on supports 20 inches apart, must withstand bending to a deflection of 3 inches without showing defects.

All bar iron (flats, rounds and squares) must be double rolled after and directly from the muck-bar (no scrap will be allowed), and must be capable of sustaining an ultimate stress of 50,000 pounds per square inch, with an elastic limit of 25,000 pounds, and a minimum ductility, measured by the elongation or reduction of area, of 20 per cent.

New England Railroad Club.

The regular meeting of this Club was held in Boston, October 13, President Marden in the chair.

Resolutions upon the death of Mr. N. W. Talcott were accepted and placed on file.

RULES OF INTERCHANGE.

The President announced as the subject for discussion the interchange of cars with special reference to the inspection of cars at interchange points, the defects in ladder rounds and handles, defective brake attachments, gauge of wheels, defective running boards, etc., and how far it is possible to remedy these defects. He said that within the past few years the subject of inspection has grown almost beyond our apprehension, and dwelt on the importance of good inspection.

By suggestion of Mr. Adams the rules were taken up *seriatim*. He thought the great difficulties at different points of inspection had been, hitherto, misinterpretation of the rules, or different constructions put upon them by different individuals.

Rule 1. That foreign cars should have the same care as to oiling and packing as home cars, was passed as plain enough.

Rule 2. *Cars must be delivered in good running order, and returned in as good general condition as when received.*

Mr. Adams: What is meant by "delivered in good running order?"

Mr. Lauder read a circular addressed to the car inspectors on his road in July last, giving instructions perhaps as plain as any that could be given in regard to car inspection. A large amount of leeway has to be given the inspector, and which must be left to his judgment. No rules could be devised applicable to all cases. Certain things are plain enough, as, for instance, a drawbar with defective rigging, a loose wheel or a burnt journal; and for anything of that kind we, of course, reject a car. But the question of what constitutes a safe truck frame may be a perplexing one, and others of the same character are constantly arising.

Mr. Adams thought that Rule 2 should read that cars must be delivered "in good safe condition," rather than "in good running order."

Mr. Lauder: A short time ago we rejected a car because it had no brake. It was claimed by the road that it came from that it was in good running order. We took the ground that it was not safe for our trainmen, though it might be safe to run on the track. I believe that the laws of the State require every car to have a brake.

My understanding of the card system is that it is to be used in case of defects that do not render the car unsafe for trainmen or on the road. A car with the roof ripped a little would be safe to run, and it would be proper to put a card on that car, agreeing to receive it back, but if the draw-bar or draw timbers were ripped off a car I would decline to receive it, even with a card upon it.

Mr. Chamberlain: I think the rule is all right. I take the ground that a car is in good running order when it has a good brake, whole wheels, the ladder-irons in good shape, where, in short, it is safe for the trainmen, and not liable to be derailed. Good running order means that, and I don't think it means anything else. If a car was delivered in unsafe condition it would not be in good running order.

Mr. Adams: I believe the rule means in good running order throughout; but others think differently. When the question is raised the safety of the trainmen is not considered at all, and when the rules were constructed I think no attention was paid to this point. Of late years this matter of the safety of trainmen has come up, and now this is looked upon as a very important consideration, and therefore I think the rule should express the idea that the cars should be in safe condition.

Mr. Soule: Rule 2 is so general in character that it does not seem to me of much practical use. If these rules for the guidance of inspectors could be made so plain and definite as to take off some of the responsibility which now attaches to the inspectors, it would be an advantage, and if they could then be printed, and hung up where they could be readily referred to by them, many difficult points which they are now called upon to decide would be much easy of solution.

Mr. Lauder: It seems to me that the rule is all right as it is, although I admit that some claim that the rule means a car that is safe to pull in a train is one in good running order.

Mr. Lauder: It seems to me that Rule 2 is simply a declaration that the cars shall be delivered in good running order, and that the following rules are to explain what good running order is. A car in good running order is all that you want, and it seems useless to say any more about it. The only trouble is that men interpret the rule differently as to what constitutes good running order.

Mr. Whitney: A car may be in good running order, and you may be able to haul it in a train, but it may not be in safe condition for freight. I don't know whether it may be refused under these conditions or not. But there are other defects than those mentioned in Rule 3 for which a car should be refused; but by inference an inspector might think that was hardly the thing, and might let it go, while another road might refuse it. So I think Rule 2 is all right, and I would amend Rule 3 to cover what is necessary.

Mr. Coughlin had seen freight cars heavily loaded, with levers and brakes striking the frogs and rails, which were very dangerous. On the other hand, the same cars light are perfectly safe: hang the brakes above the rail.

The President: I should say that Mr. Coughlin's inspectors ought to have stopped the cars in that dangerous condition.

On motion of Mr. Adams it was recommended that Rule 2 should be amended so as to read: "Cars must be delivered in good running order, and in safe condition for trainmen, and returned in as good condition as when received."

Mr. Soule: Before the discussion on Rule 2 is closed, I wish to call attention to this point: It says that cars are to be *"returned in as good condition as when received."* Upon what grounds is the condition of the cars to be determined? How are we going to ascertain the condition of the car when received? By the appearance of the car, or from memory, or from a record, or upon what ground?

Mr. Waitt: I have noticed during the past year several cases among our cars where some of them were delivered to the Albany road and by that road to the New York Central in good condition and then went west, and after six months or a year were returned for no reason in good condition. The Albany road was asked to receive them, and we were asked to receive them before they would. Now, had that road a right to require the New York Central to repair those cars and return them in as good condition as when received? What is the interpretation of the rule in such a case?

Mr. Adams: I think that a point well raised, and it is a thing we have had a good deal of trouble with. My understanding of the matter is that cars should be returned to the road owning them or to the road first delivering them in as good condition as when received, allowing for natural wear and tear, natural service. If they have been broken in any way—sills broken, doors knocked out, a wheel broken—that is breakage, not natural wear. As I understand, that refers to the natural service of the car, for which all roads get mileage to meet that liability.

Mr. Lauder: Suppose a car owned here is one off for a year on other roads, and when delivered from here the wheels are in good condition, but when it returns one or more of them is all worn out and not safe; of course, it is for the road owning the car to make the wheels good, because it has been worn out in service, and it is fair to presume that the road has received its mileage for what the car has run on foreign roads. If a car is broken, I agree with Mr. Adams that it must be put in proper condition before it is returned according to the rules laid down. If the ladder-rounds were broken or the side castings were hanging by the gills, in a car belonging to our road, I should want these things fixed before the car came back.

Mr. Soule: The trouble connected with the returning of cars "in as good condition as when received" does not apply to palpable defects but to obscure defects, which have existed for years perhaps. It seems to me when an inspector discovers defects which are palpably old, the better way is for him to return the car home. What are we going to do about these obscure defects which are not discovered at a glance? Sometimes a road gets into a trap on this account.

The President: I would like to ask Mr. Adams if a car was offered with broken sills over the transom, an old defect, whether he would receive the car, and make the repairs himself?

Mr. Adams: If the car had been gone a year or two, I should conclude that that car had been bumped pretty hard some time, if sound when it went away, and that it had not been fairly dealt with. I think it is the duty of inspectors to find out those defects. If we should receive a car in the condition the President mentions, without protest, and we attempted to deliver it again, I should expect it would be stopped on our hands, if the inspectors on the other road were sharp, and we should expect to put that sill in again. We have asked the New York Central to send all our old cars home, worn out from natural wear and tear; we do not ask them to send home broken cars. Mr. Soule speaks of defects not readily observable; not readily found. It is his misfortune if he does not find them; he must look out for them. If somebody else finds them on him he will have to bear it.

Mr. Soule: If it is self-evident that that sill was broken when the Boston & Albany road received the car, broken long before, why should that road stand the repair when the rule says the cars are to be returned in good condition? If this business is to be founded on a record of defects it ought to be understood.

Mr. Chamberlain: The card arrangement provides for all that, and if the inspector doesn't find these things the road must stand the loss.

Mr. Lauder: I think so. If Mr. Adams' inspector at Albany receives a car with defective sills and he deems it safe to run to Boston and back, he should require a card stating the condition of the sills. Then when the car comes back there is no question about its being received. Meantime if the sill pulls out, Mr. Adams can repair it and charge it to the road which put on the car.

Mr. Adams: If we should find a car of ours on the New York Central with rotten sills (the end sill may get decayed so that you would not see it, covered by the ceiling). If it should break, and clearly from its own decay, I should take the car home and say nothing about it. I wouldn't be so unfair as to have another road repair that car, all worn out that way. We have always taken back our cars from the New York Central road when they were evidently rotten from decay, and they have done the same. But when a car comes to us with sound timbers broken by collision or otherwise, though it may have been broken six months, and we don't know who did it, we look to the road which delivers it to us, the presumption being that they are responsible, because they took it. If they have not inspected it closely and allowed it to pass, that is their misfortune.

"Wheels Worn or Slid Flat, Exceeding 2½ Inches in Length or Diameter."

Mr. Soule: What constitutes a "flat" wheel—one arbitrarily flat, that can be measured with a wooden rule, or any wear from the original circular surface. There is a difference of opinion among inspectors as to what is a flat wheel.

Mr. Hitchcock: I have never yet learned what is the opinion of our master car-builders as to the size of a flat that should destroy a wheel. If we take a wheel that is 2 in. flat and run it, and slide it to 2½ in., have we ruined that wheel, or was it ruined when it was slid 2 in. flat? If we receive a car with a wheel that has been slid 2 in. flat, and it is ruined then, and slide it to 2½ in., we should be exempt from paying for it.

Mr. Coughlin: I should say a wheel was ruined when it slid 2 in., if it was a straight flat, not an oval flat. My experience leads me to the conclusion that a wheel that has been slid hardly ever gets caught again in the same place on the rail, but is caught by the brake at that place and will make another flat spot. You will find that a great many wheels have flat spots all around, simply from being caught by the brake, because it has got a flat space to catch on to.

Mr. Hitchcock: If a wheel comes to your line that has been slid 2 in. flat, and you catch it in another place and slide it to 2½, have you damaged the wheel?

Mr. Whitney: The rules provide that if we flatten a wheel to 2½ in. we are responsible for it, and we must stick to the rules until they are revised.

Mr. Lauder: I think the only thing to be considered in Mr. Hitchcock's proposition is whether the limit of 2½ in. is too great; whether 2 in. does not ruin the wheel as much as 2½ does. I don't think a flat place will catch the wheel in the same place again. If I see a wheel with three or four flat spots on it caused by sliding I think the leverage of that car is wrong. I think the rule is right as it is. A flat spot 2 in. in length on the periphery of a 33-in. wheel is not a very large spot. If wheels were thrown out for that we should throw out thousands now running.

The President: We have been following up the flat wheels under passenger cars recently. We require the inspector to report every wheel flatted, with the name of the engine, the train number, the engineer's name and the date, and we test the wheel and try to reach the difficulty, and we have reduced the injury to wheels in this way very largely. An inspector can discover an inch flat in a wheel under a car, and the flat place will continue to grow, but the wheel will not catch in that flat place, it will catch on the largest diameter of the wheel.

Mr. Lauder: How do you account for that spot growing?

The President: By the wheel sliding a second time in the same spot. In the wheels we have tested we found them worn out of round, and the brake invariably catches on the largest circumference of the wheel. I have never taken out a single pair of steel wheels flatted, except the Cooper elastic wheel. We don't have any trouble with flat wheels.

Mr. Soule: The measurement of these flat spots is what troubles inspectors. What constitutes a flat wheel has proved a vexatious question. Two inches started will presently show an abrasion close on to 2½ in. Is that to be considered as constituting a flat wheel, if it sticks in that way, and is not found?

Mr. Hitchcock: I don't want to lose sight of the idea of determining what ruins a wheel, how large a straight slide it must have to be ruined.

Mr. Whitney: The rule defines distinctly what a flat is. It must be 2½ in. long. I take it, it means flat, not oval. If that is too much, let the club say so.

Mr. Hitchcock: What I want to ascertain is, if a wheel is 2 in. flat when you receive a car, and you make it 2½ in. flat, when you return that car are you obliged to put in another wheel, or who is responsible? I claim that it was ruined when it was delivered 2 in. flat.

Mr. Adams: If I had that opinion I should require a card put on that car wheel when I received it. That would rather fasten the flat where it belongs.

Mr. Coney: Did anybody ever see a flat spot 2½ in. long either way on a wheel? I mean dead flat, so that a straight-edge would touch the whole length.

Mr. Soule: I have seen them 3 in. In regard to slidden wheels, if under the rule a wheel be rejected that is 2½ in. flat, I should consider that if I received a wheel 2 in. flat and flatted it to 2½ in., I should take it out. If we could settle how the flat spot is to be measured, it might be an advantage to inspectors.

Mr. Soule: I never saw a worn flat wheel 2½ in. flat. This is misleading as the rule reads.

Mr. Adams: I have seen lots of them.

Mr. Griggs: On taking our flat wheels, and finding them worn out of true, is the company who receives them obliged to make them good, or is the company that fitted them up to pay for them?

Mr. Adams: If one of our wheels is bored out of true, and it is clear that it slides in consequence of it, I should say that we ought to be responsible, if it is evident that the wrong boring is sufficient to cause that; but if it is slightly out of round, say not more than ⅛ in., I should say the party who used it was responsible for the flat. Perhaps, however, it would cost less to pay for such a wheel than to go to the trouble of finding out.

Mr. Griggs: I have found in most cases of this kind the wheels were new or nearly so.

Mr. Lauder: I think the phraseology in the rule "worn or slid flat" should be changed. There is no such thing as a wheel worn

flat. A wheel worn through the chill won't be flat as I understand it. We all know what is meant by worn flat; it means worn through the chill, which causes what is called a flat spot. As every one knows what the word flat means, I don't know why we should change it, although strictly speaking, there is no such thing as a wheel worn flat. I don't think there would be one case in a million where a wheel slid flat would be slid in exactly the same spot again. There is no occasion for its catching in that spot, though we find wheels catching in half a dozen places. I have seen half a dozen slid spots on a wheel.

The President: I think such wheels will be found to be round. I think the reason that wheels catch in the same spot again is that they caught there the first time from being out of round; they were bored out of round (they are often not bored straight); the brake-shoe will catch on the smallest diameter of the wheel as the larger diameter goes over. If we should say that it should be a straight measurement that would settle the question.

On motion of Mr. Lauder it was voted that it be recommended to the Executive Committee of the Master Car-Builders' Association that clause A of Rule 3 be changed to read as follows: "Wheels worn hollow or having straight flat spots 2½ in. in length, caused by sliding, shall be regarded as defective."

On motion of Mr. Adams it was voted that the next regular meeting of the club be held on the second Wednesday of November at 2 P. M., and that there shall also be an evening session.

Western Railway Club.

The regular monthly meeting of the club was held in the Grand Pacific Hotel, Oct. 20, President Scott in the chair.

After some preliminary business, the President announced that the first subject for discussion was

THE RULES OF INTERCHANGE OF CARS.

Mr. L. E. Johnson (C., B. & Q.) opened the discussion. He did not agree with the statement made at the last meeting, that the rules were good enough and ought to be let alone; or that the rules are radically wrong and ought to be changed; nor did he think with those who said the rules retarded rather than facilitated the interchange of cars. He believed there are some points liable to be misconstrued, but that as a whole the rules are intelligible. The interchange of cars has grown into great magnitude, and it requires extreme care on the part of a company's employés to prevent loss arising by their employers being called upon to make repairs which should have been done by others. Referring to the rules, he thought I and 2 were all right. In rule 3, section *f* reads, "wheels with flanges chipped, so that they are unsafe to run;" he favored canceling the last clause. Section *i* relates to the size of journals that may be passed. He would like to see journals for 40,000 lb. cars increased to limit of 3½ in. dia.; for 50,000 lb. cars to limit of 3 in. dia.; and those of 50,000 and 60,000 lb. cars increased in proportion. The next point that claimed attention was section *k*, defining limit of gauge of wheels. It has been demonstrated practically on the C., B. & Q. that the limits as given in this section are the only ones that can be considered safe, and that in accepting cars under or over these limits the liability of wrecks are assumed. He considered the matter treated by this section should receive very close attention, and great care should be taken in pressing on wheels. Found in cars offered for interchange the gauge varied from 4 ft. 4½ in. to 4 ft. 5⅝ in., and they were compelled to refuse many cars for being too wide. In section *q*, relating to leaky roofs, he thought it would be well to add "or defective floors for grain or merchandise cars." Mr. Johnson made some remarks about rules 4, 5 and 6, but as they did not come up for discussion he would not be committed at present.

It was decided to take up the rules seriatim, and rules 1 and 2 were passed without discussion. On rule 3:

Mr. Jacob Johann (Chicago & Atlantic) raised a question. He mentioned a case where an inspector accepted a car in good order, and in three or four months received a bill for wheels removed for being worn flat. Thought they could not be worn flat in running 300 or 400 miles, and that it was proper to refuse to pay the bill. The probability was that the wheels were slid flat on the road removing them.

Mr. J. Townsend (Chicago & Alton) took the same view of the case and thought the wheels slipped flat.

Mr. R. Quayle (C. & Northwestern) thought there was no difficulty in deciding whether wheels were worn or slid flat, for if the latter had happened the opposite wheel would also give some indication of having been slid.

Mr. Wm. Forsyth (C., B. & Q.) thought the discussion was out of order, as they had drifted away from the subject in hand.

Mr. Johnson saw no impropriety in having the sense of the meeting on the subject.

The President was not disposed to be too strict in holding the speakers to the rules. He wished to hear a few words on the question of how bad flat spots should be before wheels must be removed.

Mr. G. W. Rhodes thought all they need to consider is the length of the spot. Thought 2½ inches was large enough. Did not think they should accept any larger or refuse anything smaller.

Sections *b*, *c*, *d* and *e* were then passed. In regard to section *f*,

Mr. Johnson believed that wheels chipped at all are unsafe to run. The roadmasters are now working to such close limit that if a flange chipped not more than ⅝ in. strikes the point of a frog, it is just as liable to go to the wrong as to the right side, the result being a wreck. Moved that it be the sense of the meeting that the last clause ought to be stricken out.

Mr. Rhodes, in supporting the motion, called attention to the fact that this rule had the objectionable feature of being indefinite, whereas nearly all the other rules are specific. The section reads, "wheels with flanges, chipped *so that they are unsafe to run.*" Now, one inspector says the wheels are fit to run, and another says they are not, and the rule does not decide who is right. At the last M. C. B. Convention the rule was brought up, and the committee asked to define when a chipped wheel would be unsafe to run, but they answered that they could not do it. He was decidedly against permitting wheels with chipped flanges to run. It was not safe, and he was opposed to taking chances.

Mr. Johann questioned whether any wheel with chipped flanges ought to be allowed to run, and believed the proposed amendment would be proper.

Motion carried. On section *g*,

Mr. Johann considered the existing gauge filled all requirements.

Mr. Quayle found the gauge imperfect for wheels that had the flange too thick. Found that the flange was sometimes as much as ½ in. too thick at base.

Mr. Rhodes, in answer to a question from the President, mentioned that they made most of their wheels at Aurora, and found it necessary to inspect very carefully and reject wheels for flanges being too thick as well as for being too thin.

The President understood that wheel makers had been ready to harmonize with the M. C. B. Association on dimensions of flange, but no uniformity had been reached yet. They found great difference in the thickness of flanges.

Mr. Townsend found flanges varied so greatly that it is difficult following the rules for gauging wheels adopted at Niagara Falls. Thought the sooner a standard thickness of flange was agreed upon the better it would be for all concerned.

Mr. Johann had also experienced trouble with flanges of new wheels being too thick. Thought there ought to be a maximum and minimum gauge for thickness of flange. Some roads had adopted dimensions, but others had not, and he thought it was a good subject for the club to agitate so that action might be taken on it at the next convention. He also thought it was time the M. C. B. Association agreed upon a standard section of wheel tread.

Mr. Johnson believed the gauge in use perfectly reliable for showing when a flange is worn too thin or too shallow.

Mr. Quayle thought the gauge might be improved.

Sections *g* and *h* were then passed. On section *i*, which relates to size of journals,

Mr. Johann considered the dimensions entirely too small.

Mr. Forsyth moved, That it is the sense of this meeting that all the limits given in Section *i* should be larger.

Mr. Rhodes: An axle under a 40,000 lb. car that might be safe enough to run at 15 or 20 miles an hour is not at all large enough when we reach 35 and 40 miles an hour, as we are now running. A journal of that diameter at that speed is subjected to a much greater strain than it is at a lower speed, and it is much more liable to get hot than at a lower speed. Further than that, there is no hardship in making these limits higher. If our limit for a 50,000 lb. car is 3½ inches, when the axle reaches that limit we simply do not mount it for a 50,000 lb. car, but mount it for a 40,000 lb. car, and it goes as a 3½ inch axle under a 40,000 lb. car until it reaches the limit for the 40,000 lb. car, and then we put it into a 30,000 lb. car. So it does not entail much expense on railroads, excepting in the matter of the 30,000 lb. car. If we make our limit three inches, that condemns all axles when they reach that point. At our shop we condemn all axles at three inches. After all, we get a great deal of service from those axles, and do not condemn them to the scrap pile as soon as we remove them from the first-class cars. On getting back from the Niagara Convention, the first thing that I heard was that an axle had broken under a 30,000 lb. car—which measured, I forget whether it was just three inches or whether it was a little over three inches—and caused a wreck on our road. It was a clear break, the journal being too small for the load it carried.

Motion carried. Section *j* was passed. Regarding section *k*,

Mr. Rhodes regarded the outside and inside gauge dimensions very important, yet he had to admit that all roads are running cars in utter disregard of the section. Some roads running into Chicago have recently agreed to waive the figures temporarily and make the inside figure 4 ft. 4½ in. and the outside 4 ft. 5⅝ in. Even with that stretch of limit we find wheels away out. Many master car builders are not giving the subject the attention it deserves. He knew of cases where cars are being built that measure 4 ft. 6 in. between flanges.

The President mentioned that the roads referred to as having agreed temporarily to a change of limit were the Fort Wayne, Belt Line, C., B. & Q., Pan Handle, Lake Shore, Illinois Central and Milwaukee & St. Paul.

Sections *k*, *l* and *m* were passed. On section *n*,

The President raised the question how far it was desirable to receive cars with experimental draw-bars and attachments.

Mr. Rhodes wished this question treated in a broad way. When they are asked if they will accept cars with experimental draw-bars or brakes, they say yes, considers that all roads are getting the benefit of the experiments made. When other roads are going to great expense experimenting to find out the best brake or coupler, they should receive co-operation at least from those who are doing nothing. If experimental couplers are broken on a strange road, they should be replaced by proper couplers.

The President thought some of the roads having experimental couplers were not fair concerning breakages. They are not satisfied to get a standard coupler, they must have one put on exactly of the same pattern as the one broken. This sometimes leads to complications and delays.

Mr. Townsend had a case where the company demanded the identical draw-bar to be replaced.

The President thought the club ought to take up this subject and try to get it worked out so that all roads would follow the same practice when experimental draw-bars got broken. He asked if any one had been charged demurrage on a car held for a new draw-bar? He understood there had been cases of the kind.

Mr. Johnson spoke in favor of replacing experimental or patent draw-bars with a road's standard draw-bar and attaching a defect card on the car. This is the plan they follow with cars belonging to Eastern roads. The various railroads and railroad commissioners are working out the problem of what is the best draw-bar, and until this is settled nothing definite can be done; so it is right for those in charge of rolling stock to come to an understanding that will prevent delays.

Mr. Forsyth moved, That it is the sense of this meeting that when a patent coupler is injured on a foreign road, it should be replaced by a coupler similar to the standard used by the car owner. Carried.

Mr. Johann moved that a committee of three master car-builders be appointed to look into the question of replacing broken draw-bars, and report to this club for discussion at next meeting. Carried.

The President appointed Messrs. Johann, Townsend and Verbryck as the committee.

Section *p* was passed. On section *q*,

Mr. Johnson moved that the words "or floors" should be inserted after the word "roofs." Carried.

The time for closing having arrived, the discussion was closed and an agreement made to take up rules 4, 5, 6, 7 and 8 next.

Secretary Sinclair moved that the subject of driving "wheel centres and section of tires" go over till next meeting, and that it be taken up first at that time. Carried.

Mr. Johnson moved that a committee be appointed to consider the rules of interchange of cars and report to the club on any desirable changes, so that the changes may be recommended to the Master Car Builder's Convention, and that the members of the club may go to the convention as a unit prepared to act, knowing the sense of Western roads. This motion was carried, and the President appointed Messrs. Johnson, Snow and Barr as the committee.

Meeting adjourned.

Good Advice to Enginemen.

At the annual convention of the Brotherhood of Locomotive Firemen, held lately at Minneapolis, Mr. J. E. Phelan, traveling engineer of the Northern Pacific, delivered an address which was full of sound sense, and refreshingly different from the airy platitudes usually heard at such meetings. After some remarks about the aims of the brotherhood, he said:

"You desire better wages. You should first prove that you are worthy of them, then you cannot be blamed for seeking and acquiring all you can get. To improve your members in their calling, and to make them skillful in all matters pertaining to their duties, is your privilege, and ought to be your duty. As a labor organization, you should make the skill of a member at his trade the most important qualification required and insisted upon. So long as you neglect this point you make a mistake. It is an error from which the engineers' organization is not free.

"We find the Master Mechanics' and Car-Builders' Association meetings discussing year after year the most common points relating to their respective trades. They set a good example. Yet we find the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen meet year after year, and the common and important points relating to skill and advancement in knowledge pertaining to the common calling are completely ignored. But throw out a hook baited with an excursion, and you bite like a fish, and get there with a vim and enthusiasm of Sunday-school juveniles. As a natural consequence, there are hundreds of firemen who do not know the true principles of firing, and there are hundreds of engineers to whom valve motion is an unsolved mystery. They work their machine in a certain notch and in a certain way, because some engineer for whom they fired did it in that way before them. Like begets like. Firemen continue wasting tons of coal while cogitating on the best method for disconnecting an engine and getting her to the shop on one side, instead of studying and knowing the best methods for keeping machinery and the engine from falling to pieces. So long as this point is neglected and firemen become engineers without knowing how to fire or care for machinery, so long will we find engineers like doctors practicing medicine who have never learned the mysteries of the dissecting room. They can kill, but they cannot cure.

"If you furnish incompetent men for promotion, and come in direct competition with the engineers' organization, who is to blame for it? Perhaps the engineers are to blame themselves, for no one knows the qualifications of a member better than associates working side by side. So long as engineers receive and retain as members men who are unworthy in matters of morals or skill in occupation, so long will hundreds of its members seek employment in vain, and the worthy ones will hang like millstones about the necks of the worthy ones who should have positions. If we find firemen seeking promotion to engineers' positions without first knowing the duties for which he is paid—if firemen are promoted and afterward discharged for incompetency, it is somebody's business to say whether they are engineers or not. If there are men who have succeeded in drawing engineers' wages for years while wallowing in mists of alcohol, and the extravagant use and management of supplies and machinery, who can blame master mechanics for not retaining or giving them employment?

"There is need of concerted action among engineers and fireman, not for the purpose of warring on railroad corporations, nor for protection from railway officials, but for protection from each other. Not only should engineers be protected from the encroachment of firemen, but you should receive and have protection from one another in your respective organizations. You should know to what limit you may go without injury to yourselves. The fireman should have the privilege of placing an incompetent engineer on trial, and engineers should in return be insured competent and intelligent firemen. Think how humiliating it must be for a first-class fireman to fire for a third-class engineer! The engineers should feel the disgrace of having a third-class engineer in their organization, especially if he draws first-class pay."

Railway Master Mechanics' Association.

The following committee circulars have been issued:

STANDARD GAUGES FOR DIAMETERS OF WHEEL CENTERS AND TIRES.

At the annual meeting of the American Railway Master Mechanics' Association, held in Boston, in June, 1886, the report of the committee on standard diameters of driving wheel centers was unanimously adopted. The sizes proposed by the committee and adopted by the association are as follows: 38 inches, 44 inches, 50 inches, 56 inches, 62 inches and 66 inches. The committee was instructed to make arrangements with some reputable firm, to make and furnish the railroad companies, locomotive builders and tire manufacturers standard gauges representing the various sizes adopted, both for the outside diameter of wheel center and for the inside diameter of tire, for each size as given above.

The committee have made such arrangement with the Pratt & Whitney Co. of Hartford, Conn., who are now prepared to enter orders for these gauges, made in accordance with plans submitted to and approved by the committee, and will furnish them either in sets comprising the six sizes adopted, or in pairs, separately, at the following prices, which are net, delivered on board at Hartford, quotations subject to orders being received on or before Oct. 15, 1886: Set 6 pairs standard reference gauges, for outside and inside measurement, complete in finished cherry cases, with lock, $15. For parts of set in pairs, or for single pair, $26 per pair. Cherry cases for parts of set, $5 to $7 50 extra.

As it is desirable to have the new system embodying this standard of uniformity introduced at as early date as possible, and in order to take advantage of the exceptionally low prices offered, orders should be placed with the Pratt & Whitney Co. on or before Oct. 15, 1886.

The sizes represented for inside diameter of tire for each of the six gauges in full set are as follows:

38 inch less 0.040 inch..... = 37.960 inch.
44 inch, less 0.047 inch..... = 43.953 inch.
50 inch, less 0.053 inch..... = 49.947 inch.
56 inch, less 0.060 inch..... = 55.940 inch.
62 inch, less 0.066 inch..... = 61.934 inch.
66 inch, less 0.070 inch..... = 65.930 inch.

J. N. LAUDER,
JACOB JOHANN, } Committee.
H. N. SPRAGUE,

COAL DELIVERY TO LOCOMOTIVE TENDERS.

1. Describe the various systems of delivering coal to tenders that you use. If any machinery, staging or special equipment is used, send "blue print" of same.

2. Say why different systems are used at different stations, specifying which you prefer, and giving reasons for preference.

3. Give average cost of delivery per ton under each system, so that comparison may be made of value and thoroughly understood. State the average number of tons delivered each 24 hours, the number of men required in the 24 hours and the average rate of pay per 12 hours for unskilled labor. (It would make this comparison more interesting if, when a special plant, such as crane, shutes, staging, etc., is used, its first cost and maximum capacity of delivery per 24 hours were stated.)

4. Describe any special conveniences you are familiar with for cooling the bunkers of switching, tank and other engines not provided with tender.

N. B.—Replies will be treated as referring to soft coal and the short ton of 2000 lbs., unless it is otherwise stated.

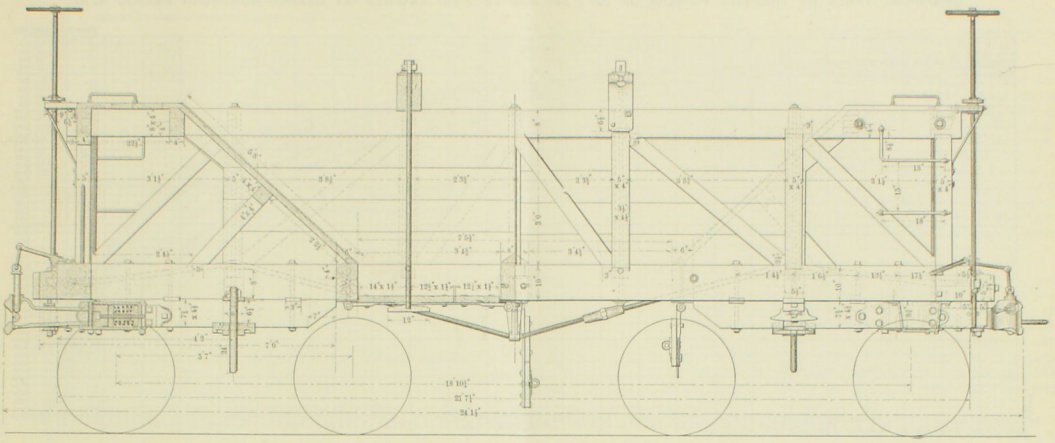
Replies to be addressed to J. Davis Barnett, Port Hope, Ontario, Canada.

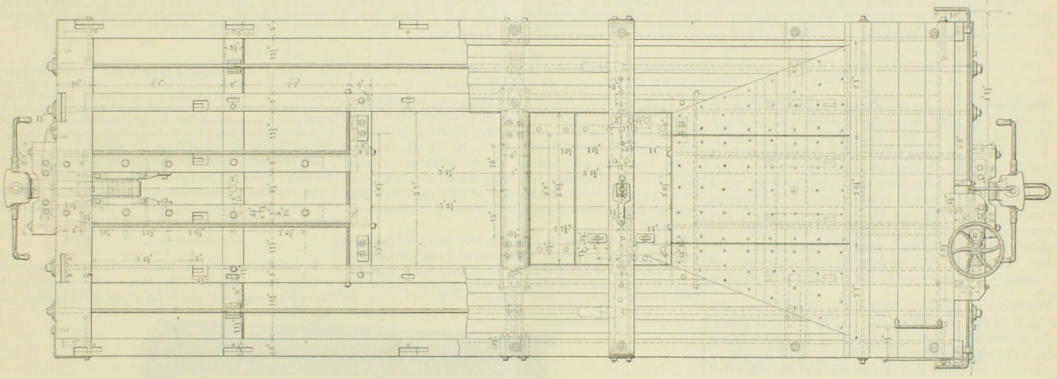
JAS. STRODE,
CHAS. GRAHAM, } Committee.
J. DAVIS BARNETT.

THE Chicago & Northwestern Railway Company have lately received from the Bay City Works, Mich., a fine steam derrick car made of iron and steel throughout.

THE steel made by Shoenberger & Co., of Pittsburgh, by their natural gas process, for locomotives, boilers and fire-boxes, appears to be gaining popularity rapidly. Five locomotives that are in course of construction by the Rhode Island Locomotive Works for the Cincinnati, New Orleans & Texas road will have boilers and fire-boxes of this steel; a group of engines that the Brooks Locomotive Works are building for the Illinois Central will have boilers and fire-boxes of the same material; and the Wabash and several other roads are patronizing this make of steel in a free way that indicates satisfaction with the service obtained.

ORE CAR (40,000 POUNDS CAPACITY), CHICAGO & NORTHWESTERN RAILWAY.

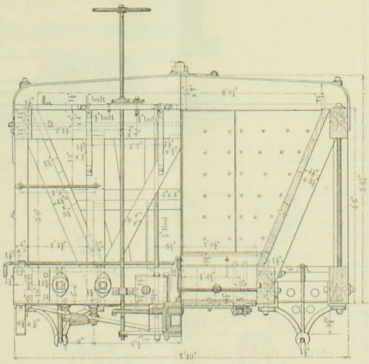




The car herewith illustrated is designed for carrying ore at the mines in Northern Michigan. The body is 21′ 7½″ long, 7′ 10″ wide and 4′ 6″ high. The longitudinal sills are yellow pine, 5″ × 10″, and the end sills are of oak, 10″ × 10″. The frame, flooring and siding are also oak. The ends of the box are lined with ⅜″ iron plates to protect the wood from the dropping ore while loading. The sides, being so nearly perpendicular, are not lined.

Each pair of drop-doors are held up with a 1¼″ iron rod, with cross-piece forged on its lower end. The upper end passes through the cross-beam, and is locked to prevent it from turning and dropping the load where it is not wanted. The center of the car is supported by two 1¼″ truss-rods provided with turn-buckles, and the body is mounted on trucks similar in their construction to the company's standard, but having a wheel base of 5′ 7″. The brake beams are hung from the truck transom.

Fifty of these cars have been built during the past summer. They are equipped with the Blocker coupler.



The Painting of Passenger Cars.

CRACKING OF PAINT AND VARNISH.

Mr. M. W. Stines, of the Barney & Smith Mf'g Co., of Dayton, O., read an interesting paper on this subject at the recent convention of the Master Car Painters' Association, in Chicago. The following are the material portions:

In the past few years a decided progress has been made in what seems to me to be the most difficult and intricate part of car painting. I refer to the proper mixing and application of body paints. These paints are not causing us any trouble, and seem to be so well adapted to our purposes that we should be careful and move cautiously in making any changes from our present understanding of them. Now, if I recommend any thing in this direction, it would be the painters' encouragement and active co-operation with the producers of good, honest paint stock, and to give as long a time as possible and practicable for drying between the coatings, especially between the priming and the coats to follow; that, so far as practicable, a uniformity of quantity and kind of pigment and vehicle of mixture should exist in the coatings between the priming and the varnish coat. Great care and judgment is required in the selection of a dryer. These dryers that are the quickest and seem to the casual observer to be the best, do not always prove so. The minimum amount of dryer in all paints used in car painting should be the rule.

For the past five or six years I have seen but little, scarcely any, trouble with paint cracking. Most of the trouble is now caused by varnish cracking. Years ago the painter took all the blame for all kinds of cracks, but now the difference between a paint and a varnish crack is so well defined that no fair-minded person blames the painter for cracks in varnish.

Why should the painter be to blame? Varnish is the only part of our stock we do not mix or prepare in some manner. It is furnished to us by the varnish maker ready for use. In many instances his instructions are followed to the letter in its use, but with no better success then when the painter exercises his own judgment. There may be some instances of disregard of the ordinary rules for using varnish, such as light, heat and cleanliness. When the advantages afforded for using varnish are such as to be disadvantageous to its use, neither the user nor the maker are responsible for its failure.

The best judgment and skill of the varnish maker and painter has not as yet provided a varnish that fully meets the expectations of the consumer. The painters in some instances have discarded the use of rubbing varnish and finish strictly with a finishing varnish. The only difference in results that I can see is that at the end of four or five years the finishing is cracked deeper than the rubbing. It is conceded by all that the work that runs the longest and wears the best is that that has had the longest time to dry between coats, but the time required for varnish to dry between coats to insure it against cracking is so long that it is practically out of the question in car painting to allow it that time.

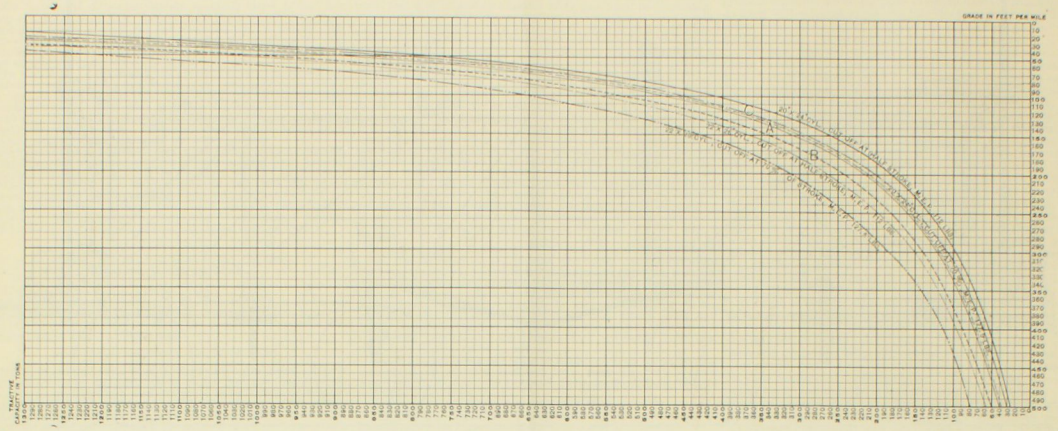
I am inclined to believe that there are more coats of varnish put on in a week than there ought to be, and that a moderate coat will dry through more evenly and last longer than a heavy coat will. I do not believe that two coats of varnish is as good as three. It must be taken into account that you must re-varnish at least once a year, and at the end of three or four years you have a very considerable film of varnish which is difficult—in most cases impossible—to keep from cracking. To avoid this accumulation and lessen the tendency to crack, would it not be sensible to commence with two coats instead of three? At the end of ten or twelve months, when a car is run in to be revarnished, instead of using water on it would it not be better to cut off the worn-out surface of the varnish with raw oil and pumice stone, and if you find that there is (which there most always is) a sufficient body of good varnish under the worn-out portion that you have taken off, put the car into service again for six months longer without revarnishing, when the car is again cleaned, and if you find it necessary to revarnish, put on only one coat instead of two, as is usually done.

Instead of sending a car out with a high glossy surface I am in favor of rubbing the finishing coats with oil and fine pumice stone to a satin luster. There seems to be something in the rubbing of varnish in this way that we do not appreciate as much as we ought to. The oil is the natural feeder and life giver to the gum, the rubbing breaks down the pores connecting them together, making a more solid resisting surface to the weather than if left glossy. The possible advantages of this plan would be in removing as often as necessary the outside worn portion of the varnish and presenting again for further service the inside or good portion. Instead of going over the car with fresh coats of varnish when not absolutely necessary, it would prevent the piling up of varnish which will sooner or later crack. It economizes the use of material and makes it possible to repaint without burning off a solid surface of paint because the old varnish has cracked.

In the past ten years a decided improvement has been made in mixing a non-cracking paint. Our experience with varnish is the same to-day as it was twenty-five years ago. the nature of the elements that it is made from may render futile any further efforts of the varnish maker to produce a non-cracking varnish. Now, the question seems to me to be this: Is it desirable that we should change our method of using varnish and make another effort for success?

THE Fitchburg Railroad Co. has ten second-hand passenger coaches for sale. Particulars in regard to same will be furnished by addressing F. S. Pratt, Purchasing Agent of the road, Boston, Mass.

GRAPHICAL TABLE OF TRACTIVE POWERS OF 20″ × 24″ AND 22″ × 26″ ENGINES ON GRADES—NORTHERN PACIFIC R. R.



Vertical Lines indicate Tons Capacity, and Horizontal Lines Grade in Feet per Mile. Points on the curves will give Capacity of Engine for any grade named in the table, from 50 feet per mile up. Line A is tractive power due adhesion of 22″ × 26″ Engine, with 100,000 lbs. on drivers, cut-off at 9.5″, M. E. P. 97.3 lbs. Line B represents tractive power due adhesion of 22″ × 26″ Engine, with 110,000 lbs. on drivers, cut-off at 11.8″, M. E. P. 107 lbs. Line C represents tractive power due adhesion of 20″ × 24″ Engine, with 86,000 lbs. on drivers, cut-off at 16.5″, M. E. P. 122 lbs. All other curves are named in the table.

The Goodwin Dump-Car.

The car shown in the accompanying illustrations is the invention of Mr. John M. Goodwin, and is designed principally for handling coal, coke, ore, ballast and like material. It is here shown as a four-wheeled car, calculated to carry about 10 tons ordinary bituminous coal or 12 tons of ore; but, if desired, the body, made sufficiently long to afford twice this capacity, may be mounted as an eight-wheeler. In such case the cargo-box would be, preferably, divided across the middle by a bulk head, and each of the two compartments, thus formed, operated independent of the other. To fit it for carrying coke the stowage capacity of the cargo-box is increased by the addition of a suitable rack.

The four-wheeled car delivers all its load on either side of track, or half on each side, or may be made, as hereinafter described, to deliver portions of its load between rails. The eight-wheeled car would deliver all its load on either side; or either half on one side and the other half on the opposite side; or either quarter on one side and the remaining three-quarters on the opposite side; and one-half of its load may be discharged and the other half retained. The openings for delivery of load at the sides are each 2 ft. in height by the whole length of cargo-box. In the car shown, when delivering its load all on one side, the discharge-opening has an area of 32 square feet. Delivering half on each side the aggregate area of openings is 64 square feet, and each compartment of an eight-wheeler would have similar outlets.

In dumping, the body of the car is not moved nor inclined, laterally or otherwise. Dumping all on one side is effected by the simple dropping of one valve. To dump half the load on each side two valves are simultaneously dropped. Release of valves may be effected by a man standing on the ground either alongside of or at end of car, or upon the car. The valves do not interfere with the running gear, and when dropped may be left in that position until return of car to place of reloading. So left, the jar and wind incident to running of car will clear the cargo box of dust and *débris* of load.

Owing to the manner in which the cargo is disposed it is claimed that the loaded car is shown by actual experiment to be about 18 per cent. more stable on its base than a gondola of equal capacity. In other words, the resistance of the car to a force tending to upset it, sidewise, is about 18 per cent. greater than that of an ordinary gondola of like capacity. The great bulk of the load lies along the line midway between the track rails.

In the operation of dumping, the body of the car remains upright, and no part of the apparatus projects outside of, nor below, the fixed frame of the car; and the car may be dumped while moving without any such risk as would attend the discharge of a rocker-dump in motion.

By use of this car, ballast or other material may be distributed evenly along a railway, the quantity deposited in any given space being regulated by speed of train. For delivery of ballast, etc., between rails, valves, specially introduced for that purpose, are used. With such valves in use, the other valves may be operated precisely as they would otherwise be. For instance, part of a load having been discharged between rails, the remainder of it may be dumped at the side, exactly as when only the side-discharge is to be made.

The car may be dumped while one side of it stands within an inch of the wall of a shed or stock house; or while the car stands on a steep incline; just as well as when it is in the open, on ordinary roadway.

The design of the car, as to framing, etc., is such as to make it thoroughly stout and serviceable. Its tonnage capacity is twice its own weight. Thoroughly built, of best material, with 33 in. wheels, M. C. B. standard axles, etc.; and lined on all sliding surfaces with steel plate of ample thickness, it is claimed that it costs no more than an equally well-built gondola of like capacity. The draft-arrangements are such as to afford a "continuous-draw-bar" effect.

The inventor claims that this car has many advantages over the ordinary form of dump car, and states that:

"There is no possibility of recoil of body in act of dumping,—such as occurs in the rocker-dumps when part of the load escapes and the rest "hangs,"—this car may be dumped on any trestle without risk of damage to car or trestle through derailment of car or "falling overboard" of body of car.

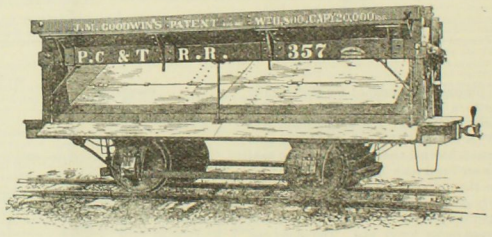
"In any rocker-dump the entire load is moved, in a body, laterally, that motion being preliminary to a discharge of the load; and where "rocker" dumps designed for thus handling loads of 20 tons, or thereabout, have been tested, the results have been any thing but satisfactory.

"In the Goodwin dump the load, in the operation of dumping, does not move in a body, except as water in a tank moves as a body when a discharge-valve in the bottom of the tank is opened. The load in the car subsides, and flows out through the discharge-valve openings in a continuous stream, more or less rapidly, according to the character of the material of the load; but there is never any violent precipitation of the load, and the discharge may be checked or entirely stopped, if necessary, at any stage of the operation.

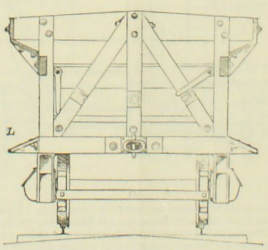
"Coal, or any friable material, is much less broken by discharge from this dump than by the operation of shoveling, out of a gondola for instance. A large proportion of the coal discharged by this car suffers no shock whatever until it lands in the bin or on the stocking-ground; and such shock is less than in case of shoveling out of gondola, because the fall from the discharging-apron of the car is some 6 ft. less than that from the shovel."

Mr. Goodwin considers that 10-ton cars on his principle are more generally serviceable than 20-ton cars.

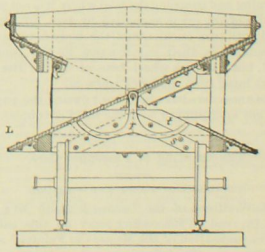
Any further information can be obtained by addressing Mr. John M. Goodwin, Sharpsville, Mercer County, Pennsylvania.



Side Elevation.

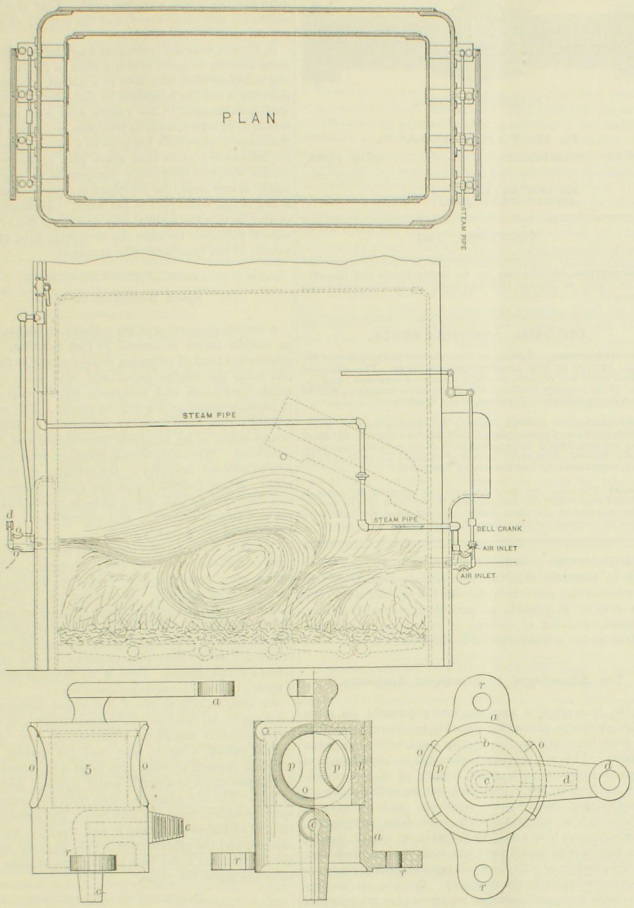


End Elevation.



Cross Section.

A CORRESPONDENT of the *Northwestern Lumberman*, writing from Kansas City, says: "At present probably there is no section of the West where there is more money paid out for railroad ties than in Southwest Missouri. This is not generally known, as the industry has been worked up within the last year until it has grown to be of great importance to the inhabitants of the rather sparsely settled section of the 'puke State.' During the past summer there have been on an average over $12,000 paid out monthly for ties at the town of Osceola, in St. Clair County. This certainly speaks well for an industry which was unknown almost 12 months ago. Black oak sells to the contractors at 25 cents, while white, burr and post oak bring 35 cents. This makes for the contractor a very good profit. This party manages to get from the railroads within 100 miles all the way from 50 to 70 cents. The supply is by no means inexhaustible, and it is reckoned that at the present rate of cutting there will be little left in Southern Missouri within 10 years."



Air Gate for Locomotive Smoke Burner.

The engravings show the details of an arrangement designed by Mr. Geo. W. Cushing, Superintendent of Motive Power of the Northern Pacific Railroad, for the prevention of smoke in locomotives, and applied to many engines on the road with which the designer is connected. The invention has been patented in order to protect the company against the thieves who roam the country in search of unprotected inventions, which they patent and often make the real inventor pay a royalty for using.

The air and steam chamber, or casing, 5, is secured by bolts passing through lugs or flanges *r* on its inner end to the outer shell of the fire-box in line axially with each of the supply tubes, of which there are usually four at front and at back of fire-box, passing through the outer and inner plates of same. The inner end of the steam chamber, which is open, communicating directly with the supply tube *a*, steam jet pipe or nozzle *e* having its outer end threaded or otherwise suitably adapted to be connected to steam pipe, is cast upon each of the chambers, 5, said jet pipes being bent at right angles so their inner ends shall be central with the chambers and supply tubes, and having their discharge ends projecting a short distance beyond the inner ends of the chambers, so as to deliver steam into the supply tubes.

The jet pipes *e e* are connected to a steam pipe leading to the steam dome of boiler, and is provided with a regulating valve for governing the admission of steam therefrom. A hollow or tubular cylindrical air valve *b* is fitted, with the capacity of axial movement in the outer end of each of the chambers, 5, the outer ends of which are closed by said valves. Air-supply inlets, or openings, *o* one or more, are formed in that portion of the shells of the chambers which incloses the valve, and corresponding openings *p p* are formed in the valve, in the same longitudinal plane as the opening *o o* of the chambers, so as to be adapted to register therein when valves are rotated into position therefor.

It may be seen that the admission of air to the chambers and supply tubes may be regulated to any desired degree, or entirely stopped, as desired, by the proper movements of air valves, for which purpose suitable connections are supplied, to be worked by the engineer.

The end reached is the combination of the air and steam within the supply tubes inserted into, and serving also as stays for the fire-box sheets, and the suitable regulation of both air and steam.

The result of this device, in combination with a suitable brick arch, is very satisfactory to perfect combustion and the suppression of smoke.

The engravings also show the style of spark arrester used on the Northern Pacific, where sparks are liable to cause danger to life and property by starting prairie fires. The extension front, high single nozzle and coned stack are said to work well in combination for the purpose they are intended to serve.

Western Railway Club.

The following circular has been issued by the Executive Committee of this club:

The meetings of the Western Railway Club will be held at the Grand Pacific Hotel, Chicago, at 2 P. M. every third Wednesday of each month. We wish to request that you will make an effort to be present at the meetings of this club, and that you will use your personal and official influence to induce others interested in railway rolling stock matters to attend. We are firmly persuaded that Western railway interests might be materially benefited by work done by this club, and it lies with railway men in the West to make it a success and a power. Most railroad men now recognize the important character of the work done by the Master Car-Builders' and Master Mechanics' Associations; but there is reason to believe that some of the work accomplished by these associations at the annual conventions is settled without receiving mature consideration. The members of committees are familiar with the details of subjects they are appointed to investigate, but the mass of members often know little about the questions their votes go to decide, and the time for discussion is so limited that decisions are arrived at and recommendations made which do not entirely represent the views of the association at large.

Now we believe that the Western Railway Club and similar organizations could do valuable service to railroad interests by discussing in advance questions under investigation or consideration by the Master Car-Builders' and Master Mechanics' Associations. There are also interests relating to rolling stock and to railroad operating peculiar to Western railroads; and we believe these would be promoted and harmonized by a strong Western Railway Club.

Very respectfully,
W. A. SCOTT,
H. L. COOPER,
W. B. SNOW,
ANGUS SINCLAIR,
} Executive Committee.

Communications.

Theory and Practice in Designing Locomotives.

Editors National Car and Locomotive Builder:

If there is one principle which I admire more than another, it is consistency. I have no use for a man who is not consistent in his walk and conversation. In science, religion, politics and mechanics, I particularly abhor mugwumps and all that relates to the ways of that character. What I dislike in a man I fail to admire or tolerate in a paper. For eight years I have been a constant reader of the CAR-BUILDER, and I liked it because I considered it was consistent in its utterances and was not changeable like the wind of an October day. Of late I have perceived backsliding, and my object in writing is to reprove a serious fault.

* * * * * * *

You have been running greatly on locomotives, and you have been advocating more heating surface in proportion to the cylinder capacity. That I consider is all right, for I think the leading weakness of our locomotives has been the small boilers. So far as I can figure it out, you have recommended about 3 square feet of heating surface to the inch of piston area, both pistons being counted. That I may call your theory; now for your practice.

In your October paper there is a locomotive portrayed belonging to the Great Western Railway. When you put a locomotive or other machine before your readers the inference is that you vouch for its being about perfect and worthy of imitation. That locomotive has cylinders 17 inches diameter, so each piston has an area of 226.98 square inches, making 453.96, or say 454 square inches for the two. The total heating surface of the boiler, as near as I can figure it, is 915 square feet, so $915 \div 454 = 2.01$. There is a material difference between 2.01, the number of square feet of heating surface to the inch of cylinder piston area, and 3 square feet which you have been recommending. What I want to know is, which is right, your theory or your practice? If one is right the other must be wrong. In several other cases your theory and practice do not harmonize, but this is the latest offense, and I like to strike while the iron is hot. It is bad enough to be humbugged with vacillating daily papers that do not define their opinions or stick to them, but the case becomes intolerable when scientific papers show a tendency to have one opinion this week and a different opinion the next. GENERAL FOREMAN.

[Our correspondent mistakes our position. We illustrate railroad machinery to show the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER the latest designs in different departments. Our opinions have nothing to do with the matter.—EDITORS N. C. AND L. B.]

The Car Coupler Problem.

Editors National Car and Locomotive Builder:

So much has been said and written on the subject of freight car couplers, that doubtless many of your readers are getting tired of the topic and wish, with others who have to deal with it practically, that it might be finally disposed of. There are, however, one or two practical points, the consideration of which may not be devoid of interest.

The problem would doubtless appear less formidable if viewed more in relation to existing conditions, instead of being considered, as it is by many, in its relation to the wide range of possibilities and requirements of the future. The link and pin system that has been so long and so generally in use, is approved, perhaps, by most railroad men, aside from the danger to trainmen and the loss of links and pins. The laws that have recently been enacted in several States requiring safety couplers to be used, have led to sundry trial tests under the auspices of railway commissioners and the car-builders' association, but in the nature of the case, nothing could be done except to report the result of the tests.

In view of the present discouraging outlook for an early and definite solution of the question, I would ask whether there is not really a common ground upon which discordant views may be reconciled? Are there not a few leading points in the way of requirements upon which all or nearly all may agree, and thus indicate the line of action by which at least some advance may be made? Properly put, the question does not seem to necessarily involve a decision as to what form of coupler may in itself be best if it could be suddenly made to take the place of all those now in use; but rather what would be the best to work with facility and safety in connection with the present form of couplers, and at the same time conform to legal and prudential requirements. The link and pin is now, and until it can be eliminated, will continue to be so important a factor in the question, that it should be taken as a datum line, or point to work from in the effort to solve the problem—taking it for granted that railroads can not afford to throw away what they now use.

A very important element in the matter is one of expense. A coupler that can be made to conform to the different styles of draw-bars in vogue upon the different roads will be manifestly cheaper both in first cost and in

repairs than one necessitating a change of pattern and method of attachment, and if an automatic device can be added by some slight changes of the draw-head, without interfering with the dimensions, cost and mode of attaching the draw-bar to the car, or by some similar inexpensive means, the difficulty would be largely overcome, and in case of breakage, the style of draw-bar in current use could be inserted if one of the improved kind were not at hand.

Another, and perhaps the chief point, is to provide for safety coupling to different heights of draw-bars, so that trainmen would not have to go between the cars. If this can be done, and meanwhile observe the conditions noted above—of preserving dimensions, manner of attaching, etc.—the result would be a combined automatic and safety action, which would be a long step in advance, and one that the present generation might well be content with.

Many inventors have sought to produce entirely new forms of couplers, and have apparently overlooked the fact that the present equipment of some 800,000 freight cars is supplied with link and pin, and their efforts have been principally in the direction of bringing out something purely automatic, whether of the link or hook type. A coupler that is simply automatic with itself may have no provision for coupling easily and safely with the link and pin, and particularly where there are differences in height of draw-bars, and they may thus increase rather than lessen the danger to trainmen.

From the foregoing it would seem that the primary requirements of the case are :

A coupler automatic with itself, and automatic with the link and pin of similar height.

That can be safely and easily coupled and uncoupled to and from the link and pin of dissimilar heights of draw-bar, as well as such of the hook and other forms of coupler as may be in use.

That can be easily set not to couple.

That can be adopted without changing the form of draw-bar.

That will cost but little, if any, more than any given pattern of link and pin draw-bar.

The requirements of strength, durability, coupling on curves and at fast and slow speed, etc., are matters of course.

CECIL.

Stock Cars Should be Kept Clean.

On some railroads stock cars are systematically cleaned as soon as the stock are landed, but on other roads cleaning is not done till the accumulation becomes inconvenient in loading the cars. Cleanliness is nearly always a paying practice, but cleanliness with stock cars ought to pay particularly well, if we judge by figures taken by a Western railroad company noted for doing work understandingly. A great many stock cars were weighed with all the dirt accumulated by carrying stock one long journey, and then they were weighed when the cars had been cleaned. The following are six of the cars taken at random out of the list :

Weight of dirty car.	Weight of clean car.	Difference.
23,900 lbs.	22,100 lbs.	1,800
24,500 "	22,900 "	1,600
25,000 "	22,600 "	2,400
22,800 "	22,400 "	400
31,000 "	25,000 "	6,000
24,600 "	22,300 "	1,300

According to these particulars, the average weight of a clean car is 22,883 pounds, and the average weight of the dirt that ought to be removed without delay, is 2,250 pounds. It is of some general interest to remark that the numerous roads which follow the practice of cleaning their stock cars at the loading points haul about ten per cent. of useless weight in moving empty cars. As transporting a ton of weight costs money, it might be an interesting problem to calculate the amount of income wasted in hauling trains of manure-weighted stock cars hundreds of miles daily.

A Device for Abolishing Frogs.

A railroad track crossing, invented by Mr. F. J. Hoyt, that dispenses with the use of frogs, has been on exhibition at Chicago for some time, and attracts a great deal of attention from railroad men. The place of the ordinary frog is taken by a revolving beam, which operates in unison with the switch. When the switch stands for, say, the main track, the side of the revolving beam is up which holds a section of rail that fits the main track. When the switch is set for a side track, a side of the revolving beam is up that holds a piece of rail to fit the line of the side track. The beam rests on a solid foundation which makes the movable rail as firm for the wheels of a passing train as any other part of the permanent track. The only weak point we can see to the device, is that the pit the beam moves in might fill with water and freeze solid in winter. Apart from that, the invention has many excellent features. It dispenses with the use of a guard-rail and makes the main line an unbroken track. There is no doubt that many broken wheels and bent axles are due to the blow received in passing over frogs. A device calculated to end that source of damage, and one which dispenses with the deadly guard rail, is certainly a valuable contrivance.

NATIONAL CAR AND LOCOMOTIVE BUILDER

PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE.
MORSE BUILDING.....NEW YORK

JAMES GILLET,
ANGUS SINCLAIR, } Editors.

NOVEMBER, 1886.

Subscription.—*$1.00 a year for the United States and Canada; $1.50 a year to Foreign Countries embraced in Universal Postal Union*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

OUR DIRECTORY.—Railroad officers will do us a great favor by promptly replying to circulars sent from this office requesting corrections for our list of railroads. We wish it to be as reliable as possible in respect to names, addresses, etc., and in making it so, we are largely dependent on the attention given to these circulars.

The Advantages of Recording Accidents.

There is a practice growing into popularity on some foreign railways, of making monthly reports of accidents that have happened to the rolling stock belonging to the company. This is a practice that might be introduced on American railroads with great benefit to all concerned. There has been so much prejudice among railroad officers against giving publicity to accidents and failures of machinery, that important data have been suppressed, and information that would be valuable as object lessons to the mechanical department has been lost through fear that the practice of collecting full reports might give away facts not creditable to the company. Putting on an imperturbable look, and assuring reporters that no accident has happened, may be good business policy ; but everything relating to accidents should be carefully recorded and submitted to the officers interested, even if it be done in strict confidence. When a wheel or an axle breaks, all particulars relating to the make and length of service ought to be recorded in a way that would show at a glance whether or not that make had a good record. The same system of recording particulars of breakages is likely to have a beneficial effect when applied to all parts of railway machinery. Breakage is an indication of weakness or of carelessness, and there is no better way of stopping accidents of the kind than by recording exactly under what circumstances they occur.

In conversation with an old car shop foreman lately, we learned about a case which illustrates the advantage of making a clean record of accidents. In a large order for new cars there was a peculiar form of spring-plank hanger specified. When the cars went into service there soon began to be accidents from the spring-planks dropping down. The car repairers got considerable extra work putting in new hangers and fixing up the damage done by broken hangers, but the officers of the road were not aware that a dangerously weak hanger was supporting an important attachment employed in the new cars. One day a spring hanger broke in a train that was approaching a high trestle, and caused a most expensive wreck. A sort of investigation ensued, and the master car-builder found out for the first time that breakages of the hangers were common. A company that carries on its business in a slipshod way often has to pay very dearly for information, and this was a case in point.

It would be interesting to find out how many cylinder heads were broken and how many delays to important trains happened on the average road before the mechanical department became convinced that cast iron was not strong enough for locomotive cross-heads. We lately noted the case of a road that began to have trouble with broken eccentric straps. No change had been made in the character of the castings. When a case of this kind comes up, many men in charge are puzzled and conclude there must be some carelessness leading to the damage. In some cases it may be carelessness or inferior lubrication, but in the instance referred to the trouble was that the engines were doing heavier work than they had formerly done and the straps were too weak. That fact the master mechanic soon discovered, and the remedy of strengthening the pattern was proposed.

In no line does the truth that knowledge is power apply more directly or more usefully than in the line of detecting weakness that will lead to accident. Tabulated facts showing what has happened in the past are likely to tell what will happen in the future, and wise men will use this kind of information to interpose remedies. If a certain breakdown frequently happens to a certain class of engine, the inference is plain that some part is too weak. If a certain accident frequently happens to an engine in the hands of one man, the inference is equally plain that he is neglecting some part of his work. Accidents are happening in this methodical way daily, yet the proper inference is not made because the necessary data are not collected, or not systematically arranged.

Speed Recorders at Work.

A serious proportion of the railway accidents happening to freight trains is caused by fast running. Some engineers are fond of swinging a train along as fast as they can keep the engine going, and with such men in the front, conductors and brakemen usually make no effort to regulate speed on descending grades. The accidents to freight trains have been so numerous of late, that the causes ought to be carefully investigated and full reports published. Were this done it would be seen how destructive to railroad property is the practice of reckless running. Where freight trains are under proper brake control they can be run safely at high speed, but the great mass of freight trains are still controlled by hand brakes that reduce speed slowly.

On many roads freight train men make no effort to save time at stations by getting away promptly. They linger round, often gossiping, and depend on the lost time being gained by the engineer "letting her out." The train goes spinning along at a speed nearer 40 miles an hour instead of the schedule time of 15 miles, an obstruction is suddenly encountered on the road, brakes are called for, but the brakemen hardly have time to get to the top of the cars when a smash occurs. This is no fanciful picture. It is a record of daily occurring experience.

We were talking to one of the ablest railroad superintendents in the West on this subject lately, and he showed us his accident record for a number of years. In analyzing the record, it can be seen that for several years the accident expense account kept on at a high average, then it dropped down to a much lower average and went on at that. The low average began with the introduction of speed recorders upon the way cars. The speed of all the freight trains on that road is now reported by speed recorders, and the officers consider the expense incurred for the instruments is the best paying investment the company has made for years.

Railroad Clubs.

These organizations have sprung into existence within the past few years and seem to be a necessary accompaniment of railroad progress. As yet they have been formed only at a few of the great centers of railroad activity, but as their advantages become more fully appreciated their numbers and membership will doubtless be largely increased. The growth and interchange of traffic have gradually consolidated the railroad interests of the country into one system, so far as the construction and management of rolling stock is concerned. The smaller and more isolated lines are being compelled to conform more and more to the practice of the larger ones. It is this inevitable tendency which led to the formation of the Master Car-Builders' and Master Mechanics' Associations, the value of whose work in their respective spheres cannot be rightly estimated without knowing just how much confusion and wasteful expenditure there would have been in the absence of such organizations. Nor can it be known how much more and better work would have been done had these associations been aided in years past, as they are likely to be in the future, by the knowledge imparted and acquired by the members of a dozen well-conducted and well-maintained local clubs.

This might, perhaps, go without the saying. Some three or four prominent clubs are now permanently organized, and will hold regular monthly meetings during the next six or seven months. These meetings ought to be more prolific of results than previous meetings have been ; more profitable to railway men in the way of drawing out information from those who would otherwise keep it bottled up for private use. The discussions should not be so informal and conversational as to cause members to lose sight of "the question before the house," or waste time in trivialities ; nor so constrained and parliamentary as to frighten diffident people who have something to say that is pertinent and to the point, but can't say it in glib oratorical fashion. The presence of a shorthand reporter is with some a serious check to the easy flow of words, and others are reluctant to give publicity to their views for fear of criticism.

During recent years the locomotive and car departments of the roads have been combined under one management

to a greater extent than formerly, although the two constructions are as distinct as ever. This makes it proper that the two departments should be represented in the clubs, where questions pertaining to each can be discussed to mutual advantage. The clubs can thus become important adjuncts to the Master Mechanics' and Car-Builders' Associations, the committees of which need the information to be derived from the monthly meetings of the clubs, in preparing reports for the annual meetings of the associations. Aside from this, it may be said that a regular attendance at these meetings prevents a railway mechanic from getting rusty from comparative isolation and from being restricted to the routine and practice of a single shop or road, the effect of which is to contract his views and confirm him in obsolete notions that are a hindrance to progress. The usefulness of a club depends upon the information it disseminates. What is said and done at its meetings is for the benefit of railroad men everywhere, and should not be hidden under a bushel. There may be a good deal of chaff, but there will always be some wheat.

The Elevated Railways of New York City.

The growth of traffic on these lines since they were consolidated as the Manhattan Co. system, in 1878, has been uninterrupted and almost marvelous. During the first year after the consolidation, which ended September 30, 1879, the number of passengers carried was 46,045,181, there being at that time only 23 miles of track. In 1880, the total length of track was increased to 32 miles, and the number of passengers carried during the fiscal year was 60,831,757. The return for the year ending September 30, 1886, with no increase of mileage, shows a traffic for that year of 115,109,591 passengers, or a daily average of 315,369, the gross earnings for the year being $7,426,216, which is an increase of $2,813,241 over the earnings for the year ending September, 1880.

At this rate of increase the average daily traffic will reach 550,000 in about six years, or in 1892. But the recent reduction of fares to five cents will transfer a great many passengers from the surface to the elevated lines, upon which they will have quicker transit at the same rates, and also better cars. This will swell the traffic of the lines to a point exceeding what is indicated by the ratio of increase during the past few years, and subject the structures to a more severe strain than ever. The question of safety is now becoming paramount, and naturally causes some apprehension. In view of the almost miraculous immunity from accident attending the operation of these roads thus far, a single breakdown now, involving loss of life in consequence of the failure of girders, pillars or bolts at any point in the 32 miles of track, would shake confidence in the strength of the structures to an extent that would cause a stampede to the horse cars, and raise a clamor for underground rapid transit that would brook no delay. In regard to the present condition and capacity of these structures, a reassuring statement of Col. Frank K. Hain, the general manager of the Manhattan Co., has been published in one of the evening papers, the material portions of which we summarize:

Col. Hain says that each section of the structures is practically independent of the others, being supported by its own girders. The only connection between the sections is the bed and rails of the track, which certainly does not weaken the strength of the road as a whole. Each section is about 40 ft. in length, and every piece of iron in it has been tested to sustain a pressure of 50,000 pounds to the square foot. The cars are 28 ft. long and weigh 13 tons each. The engines weigh 22 tons, and are approximately 15 ft. in length, so that no one section has to support at the same time more than the combined weight of an engine and car plus the passengers in the car, no matter how many trains may be running on one track. Each section is only subjected to one-sixth of the strain it can endure, leaving a margin of five-sixths on the side of safety. The longitudinal strain and vibration caused by one train ceases before the next train is fairly at hand.

Furthermore, the roads undergo a constant and minute inspection by a large number of trained men, about 450 in all, making it impossible for any flaw or break to remain undiscovered. A daily report is made by these inspectors. Not a single new girder or pillar has, to Col. Hain's knowledge, been put up within the last ten years to replace an old one. When the elevated roads began operations the intention was to run trains of three cars and 16-ton engines, but now five-car trains are run with 22-ton engines, but the additional weight does not affect the solidity of the structures. There is, of course, a limit to their capacity for transportation, and Col. Hain thinks this limit will be reached when there is a carrying business of 700,000 passengers per day.

Banish the Engine House Wood Pile.

A problem connected with the locomotive service of our railroads awaiting solution is an easy, cheap and efficient means of starting fires in locomotive furnaces. There has been no advance effected in this direction since the railroad era began. The first locomotives run had their fires started with wood, and the most pretentious in use to-day have the fires started by firewood and greasy waste, the smoke from which is a crying nuisance. But a worse nuisance than the smoke from greasy waste and green wood is the huge pile of firewood that must be constantly stacked about engine houses where many locomotives are daily fired up. These piles of firewood are the despair of every foreman with a taste for neatness and order, and the presence of so much inflammable material is a constant menace of fire. Besides these objections to the familiar wood pile, there exists the additional cogent objection that handling so much wood comes to be very expensive, and in many districts the wood itself is becoming very dear.

We are not aware of any source of expense and annoyance connected with railroad operating that has met with so little attempt at remedy as that relating to the starting of fires in locomotive fire-boxes. Where wood is so expensive that roads make the attempt to restrict its use, the alternative resorted to has been cleaning the fires of locomotives when they come off the road, and then keeping the fire banked till time for the engine to go out again. If all the coal used in this way for the purpose of saving wood was weighed and the cost counted, it might be found in many cases that the intended method of saving was a means of additional expense. Some foreign roads follow the practice of firing up their locomotives with fire taken from a furnace maintained for the purpose, but we have not seen this practice tried on any American roads. This practice we consider cheaper than that of keeping a banked fire in the fire-box, but it is as dirty as firing up with wood, and is to some extent dangerous as a means of causing fires where they are not wanted.

It appears to us that American ingenuity might devise a method of igniting coal on the grates of a locomotive by means of gas or coal oil. On steamers used by the Central Pacific Railroad, coal oil is used as fuel, and the combustible is thrown from jets on to a bed of fire brick. By a modification of that plan, jets of oil could be injected upon a bed of green coal, which would soon ignite from the heat generated by the burning oil. It would not take the exercise of great ingenuity to make jets of gas serve the same purpose in places where gas could be readily obtained. We are persuaded that a simple way of starting locomotive fires would fill a "long-felt want" which would be duly appreciated.

Western Railway Club.

Western railroad men have evidently come to realize that a good railroad club is calculated to be of valuable service to railroad interests in the West, and this conclusion being reached, they have determined by combined personal effort to make a club which shall be well worthy of support. Till lately, there appears to have been some misapprehension among Western railroad officers as to the real object and purpose of railroad clubs. Many of them regarded the clubs formed to bring railroad men together monthly, as being of a semi-social character, where the members would find personal enjoyment in the company of others engaged in kindred business, their mutual railroad interests being the thread that bound the organization together. A club formed on such a basis could have no vitality. The officers in charge of our various railroad mechanical departments are too busy and too earnest to waste their time in traveling long distances, as many of them do, to attend meetings, if such gatherings were not going to be devoted to earnest, practical railroad work. It was evidently because men of this class perceived that business and not trifling was the aim of the Western Railway Club, that they have rallied so strongly to its support.

The first meeting of the season, held in September, indicated that a new era had dawned for the club. The old members came out in strength and seven new members joined, several of the latter being known as the ablest and most enterprising railroad officers in the West. At the October meeting seven more new members were added to the roll, five of them being men in charge of railroad mechanical work. The discussion of the Rules of Interchange of Cars, which has been taken up, was carried on in a vigorous style that displayed great variety of opinion and independence of judgment, and showed that Western railroad men understand very clearly what their needs are respecting interchange of cars, and in regard to rolling stock matters in general. Apart from the public work done in the meeting, we have noticed an inclination among the members to get together privately before or after the meetings to discuss misunderstandings that have arisen between roads interchanging cars, and there is no doubt but labor of this kind will do much to prevent avoidable delays. There is every reason why Chicago should have the best railway club in the country, for the city is the centre of the greatest railroad system in the world. The railroads of the West are noted for their enterprise, and the officers in intelligence and professional ability worthily represent the roads.

A Hundred Miles an Hour.

A paragraph is printed in a Western railway journal with the startling heading, "300 Miles an Hour by Rail," the figures being evidently a misprint for 100, as the writer immediately sobers down to the actual accomplishment of 81 miles in 61 minutes as the greatest train speed yet attained in this country. This was the well known Vanderbilt spurt on the New York Central; and as the next best performance, 75 miles is quoted as the maximum speed of the Chicago Express on some portions of the Pennsylvania system. As these speeds so amazingly surpass the modest 12 and 15 miles an hour which Stephenson had the temerity to predict some sixty years ago when the iron horse was a colt, it is natural to conclude that it is now only a question of time when passenger trains will score 100 miles an hour on American railroads. The feat may be accomplished one of these days as a parade performance not often to be repeated, but under existing conditions the outlook is not encouraging. There are many people who remember traveling by rail thirty years ago, on little spots here and there, at the rate of a mile a minute, which was then considered a pretty lively jog, and so it is now, saying nothing about weight of trains or wear and tear of running gear. As there is a limit to the velocity of bullets, the height of spires and depth of mines, so there is also to the speed of trains, but the limit in either case will probably never be fixed to the fraction of an inch or second of time. That, however, is no reason why we should not keep on trying.

Lower Fares and Better Profits.

The tendency of low fares to increase the profits of passenger traffic, when a reduction of rates is sure to augment the volume of traffic, is forcibly illustrated by the recent experience of the elevated roads in New York city. For years past these roads have been operated on the basis of five cent fares during certain hours of the morning and evening, and ten cent fares at all other times. A few weeks ago, the directors of the company decided to reduce the ten cent fares to five cents on all lines except the Sixth Avenue, which is the most central between the North and East rivers, and consequently attracts an amount of traffic during the five cent hours fully equal to its capacity for handling trains. The effect of the uniform five cent fares on the other lines was to largely increase the number of passengers, especially on the Third Avenue, and swell the profits beyond what they were previously. This result was an argument in favor of low fares that could not be resisted, and the directors very promptly made the same reduction on the Sixth Avenue line, so that now the fares are five cents on all the lines of the system. The effect of the change on the Sixth Avenue traffic remains to be seen, but there is no reason to doubt that the increase of travel will be as great, and even greater than it has been on the other lines.

THE season of short days is at hand when the workers in railroad shops can hardly fail to realize the fact that daylight is better than artificial light. Electric light is a very good substitute for daylight, but it costs more. Many shops, especially old ones, have small windows and low roofs, and so great is the obstruction to outside light on cloudy days, that gas or lamps have to be used. New shops of modern design are constructed on a better plan as to the admission of light. The windows are larger, better located, and there are more of them. But many of the old shops are more dingy and dismal than they need be, owing to the accumulation of grime and dust on the windows. If the windows were thoroughly washed at proper intervals, the additional light obtained would more than compensate for the cost. Whitewashing the walls also helps very materially to increase the light, and it is a wonder that these wholesome and effective expedients are not more frequently made use of in shops where they can be applied to advantage.

MR. GEORGE M. PULLMAN is said to be in the habit of boasting about the amount of free advertising that he can get from the newspapers, but we suspect that he is not crowing to any great extent over the notices he has got from the Chicago dealers lately without money and without price, concerning the Bradley frauds and the punishment of the defaulter. The opinion, freely, frankly and gratuitously expressed, has been that the extravagant habits of the Pullman city moguls has a demoralizing effect upon the upper employés of the place, and the un-American methods in vogue at Pullman have been severely censured. Bradley has been sent to the penitentiary for five years, and is the third or fourth trusted employé of the Pullman company now in jail.

THE BOSTON AUTOMATIC CAR COUPLER continues to make a very favorable record. It is of the vertical plane type, and is now in use on the Boston & Lowell; Fitchburgh and New York & New New England roads; and also on the National Dispatch and Boston Live Stock Line, which is to have some 500 of its cars equipped with it. In addition to the tests at Buffalo in 1885 and at Albany in June last, it has also passed successfully some very severe tests recently made in the yard of the Michigan Central road at Chicago, and which were witnessed by a number of prominent railway officials. The coupler can be operated as well with one head open as with both, and no springs are required.

THE October number of the *American Railroad Journal* announces that it has been purchased by Mr. M. N. Forney, who will hereafter be its editor and owner. It also states that he has arranged for the purchase of *Van Nostrand's Engineering Magazine* on the completion of its current volume, at the end of the year, and that "the two publications will then be consolidated with the title of the *American Engineering Magazine and Railroad Journal*, which will be devoted to the discussion of engineering and mechanical subjects.

The Vose Graduated Coil Spring for Cattle Cars.

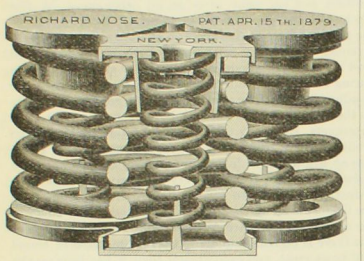
Some few months since, the New York Central and the West Shore Railroad Live Stock Department determined to build some improved cattle cars. It had been brought to their notice that Col. Richard Vose was making a "Graduated" coil spring which would carry the car and live stock equally as well as the elliptic ordinarily used, at a cost of at least $15 per car less for springs. To determine whether this claim was correct, Messrs. Dutcher & Eastman determined to make a train of 20 cars, 10 to be hung with elliptics and 10 with the Vose spring, and these cars to be sent to Chicago, there loaded with cattle and returned to New York, a careful record of the same being kept. This was done, and at the terminus the result showed a greater loss in weight per head of cattle in the cars hung on the elliptic. Messrs. Dutcher & Eastman, not being fully satisfied, repeated the experiment with the same cars, and the showing was so largely in favor of the Vose spring that they were immediately adopted, and Mr. Vose was favored with an order for 150 sets, and has already made delivery of same. Mr. Dutcher expressed himself as follows:

NEW YORK, Aug. 6, 1886.

Richard Vose, Esq.:

DEAR SIR: We take pleasure in informing you that after a thorough and practical test of the Vose Graduated Cattle Car Spring against the Elliptic on a train of 20 cars (10 fitted with Elliptic and 10 with your spring before named) loaded with cattle, run from Chicago to New York, we are so well pleased with the success of your spring in the competition that we have recommended Mr. Buchanan, Superintendent Motive Power N. Y. C. & H. R. Railroad Company to place them under the new cattle cars now building. Yours truly, J. B. DUTCHER.

The Elliptics were furnished by other parties, and were 22-inch center. The Vose spring is similar to the regular Vose Freight Bolster Spring (*twin*), only "triplet" in form, as shown by the cut.



The idea of substituting a coil spring for use under cars where it has been supposed nothing is equal to an Elliptic, has not been very successful until the celebrated Vose Graduated Spring was taken up and tested by several roads, and they have been greatly benefited by their foresight. About a year since the Michigan Central Railroad had built 250 stock cars and used the Vose spring, "quadruplet" in form. That they have been a success is amply certified to by the following (copy of) letter:

DETROIT, Mich., Aug. 27, 1886.

R. Vose, Esq., New York:

DEAR SIR: Referring to your favor, 20th inst., I take pleasure in giving you my views as to the cattle cars running on this road, hung with the Vose Graduated Car Spring. When I decided to adopt the spring in preference to the Elliptic, I felt certain that my judgment would prove correct as the greater ease and comfort of the stock, and which has been proven by actual test.

Yours truly, ROBT. MILLER.

Colonel Vose is now making a spring similar to the cattle car spring, to be used on the bolster in place of an elliptic under passenger cars. Recent tests have shown that this spring has equally as good motion as the elliptic, and soon it will be practically demonstrated by being put under cars in regular service.

The Old Colony Railroad have a great many passenger cars hung with the Graduated springs on the bolsters in place of Elliptics, and they are perfectly satisfied with them. This reduces the cost per car considerably.

Among the many roads that have adopted the Vose Graduated Spring for freight cars are the New York Central & Hudson River, Michigan Central, Boston & Albany and Boston & Maine.

Inspection of Cars at Points of Interchange.

At a meeting composed of R. H. Soule, New York, Lake Erie & Western and New York, Pennsylvania & Ohio; R. C. Blackall, Delaware & Hudson Canal; John Medway, Boston, Hoosac Tunnel & Western; and J. W. Marden, Fitchburg R. R., held at Binghamton, N. Y., Oct. 21, 1886, for the purpose of arranging for the more prompt movement of cars at points of interchange between their respective roads, the following was unanimously adopted:

WE WILL RECEIVE CARS WITH

Truck bolsters showing a crack across section not more than three inches measured vertically.
D ue springs with one break in outside coil. On card.
Cracked draw heads. On card.
Draw-bars that can be pulled out by hand not to exceed two inches. On card.
Draw-t-abers properly reinforced. On card.
Brake wheels with one cracked spoke when there are six spokes in wheel, *i. e.*, a brake wheel mast have five sound spokes.

WE WILL NOT RECEIVE CARS WITH

Running-boards broken or defective.
Brake-st p defective.
Ladder-round defective or missing.
Wheels (double plate) with more than three cracked brackets.

This agreement to take effect at once.

The Master Car-Builders' Club.

A preliminary meeting of this club was held at the rooms, 113 Liberty street, New York, on Thursday evening, Oct. 21, to make arrangements for the series of meetings to be held during the winter. The next meeting will be held on Thursday evening, Nov. 18. The subject for discussion will be "The Rules of Interchange of Freight Cars, especially as Regards Repairs,"

The Majority Must Rule.

We have frequently written, says the *American Machinist*, in favor of the formation of mechanics' and engineers' clubs for the purpose of mutual improvement. Such clubs have in a number of instances been formed, and some of them are doing excellent work. Others, we are sorry to say, have been broken up or crippled by foolish internal dissensions. As such clubs increase in membership and importance, it is necessary to establish rules for government, and right here is where the trouble begins. The members do not understand the importance of yielding to the will of the majority. It is a fact, and it is not creditable, that when mechanics or engineers unite for the most praiseworthy purposes, the last thing they learn is that the majority must rule, and that the minority should submit, so long as no question of absolute right or wrong is involved. Very frequently they never learn this, and associations that might do much good go to pieces in consequences.

THE *Mechanical Engineer* says: "The use of italics in composition is obsolete and unnecessary. Aside from the appearance of them it is a confession that the reader is not able to perceive the drift of the writer's remarks, and italics are an imputation upon his good sense and intelligence. Italics add nothing to the force of an assertion." True, every word of it.

THE fat man in the plaid clothes went out of the car and left the door open so wide that the wood-box was out of doors. As the brakeman closed the door with a slam that made the engine bell ring, he said: "I'll bet ten dollars that man's a fool." "I'll take the bet," said the commerc al traveler; "he's one of the directors of this road." "Gimme your ten dollars," said the brakeman.

THE YALE & TOWNE MANUFACTURING CO., of Stamford, Conn., have issued a new catalogue, illustrating and describing the various kinds of cranes made by the company. It will be a curious kind of crane that a railroad man is looking for if he can not find something like it in this catalogue, and it may be as well to mention right here that most men in charge of railroad shops ought to be looking up the subject of good cranes, for in the methods of handling heavy material our railroad shops are conspicuously behind the practice of all other countries making any pretensions to civilized methods. If any railroad man is a little rusty on the crane question, and does not know just what he wants, we would advise him to get the catalogue and read the introductory chapter. He will then know all about the subject, for the chapter referred to contains the best essay on cranes we have ever read. There are 100 plates illustrating the various forms of cranes and their attachment.

THE WESTINGHOUSE BRAKE CO., of Pittsburgh, have issued a very handsome new edition of their air brake catalogue. This edition illustrates the automatic brake, as applied to both passenger and freight rolling stock, and also the train signaling apparatus. All the details of the brake are made very clear by numerous admirable engravings and plain letter type descriptions, leaving nothing more to be desired in the way of making the brake plain to the dullest understanding. The man who sets to work and industriously studies the working of the Westinghouse brake, with this catalogue to aid him, and then fails to comprehend the mechanism, is not fitted by nature to operate anything more complex than a shovel.

THE SHEFFIELD VELOCIPEDE CAR CO., Three Rivers, Mich., have issued an illustrated descriptive catalogue of their three and four-wheel hand-cars adapted to railway uses. The different styles of construction are shown in the engravings, including telegraph, inspection, section, bridge-gang and push cars. There are also illustrated descriptions of the Dodge rotating stand-pipe, the "Hagan" safety steel car wheel and the Security grain door, with a list of railroads using the hand cars of the company's manufacture.

THE DAYTON MANUFACTURING CO., Dayton, O., have issued a very complete and profusely illustrated catalogue of fixtures used in the construction of railway passenger coaches, including door locks, latches, knobs, butts, etc. The various patterns are admirably represented in the engravings, and embrace many unique and original designs and styles of finish. The catalogue also contains a detailed list of prices, a complete index and a key to enable purchasers to indicate the kind of finish that may be desired.

THE Missouri Car and Foundry Company, of St. Louis, who were burned out recently, are now on their feet again and are energetically endeavoring to make up for lost time. Their woodworking shop is said to be the best equipped of any car works in the country. Among other machines selected for this department, was a "Lightning Flooring Machine," manufactured by the Egan Co. of Cincinnati, Ohio. It was thoroughly tested on siding, roofing and decking, and so satisfactory were the results that they ordered five more of these machines—making six in all.

The Egan company have reason to feel proud that they have so many of one machine in a single shop, as it is a most excellent proof of efficiency, as the machines were selected on account of the great rapidity with which they turned out fine, smooth siding and roofing.

OWING to the growing demand for the Boies (formerly Dickson Steel Wheels, and the increase of business in the locomotive department of the Dickson Manufacturing Co. (Scranton Pa.), where these wheels are now made, it has been found necessary to establish a separate plant for their exclusive manufacture. The ground is already broken for a large and thoroughly equipped shop, which will be pushed rapidly to completion. The hydraulic plant for flanging, stamping and corrugating the wheel plates has been designed by the Niles Tool Co., who are now arranging hydraulic cranes and hoists for the new plant. Mr. Pierson, the late foreman of the Dickson Co.'s shops, will be the superintendent of the new works, and Mr. Boies also expects to give the shops his personal attention, thus insuring the standard of excellence that has been maintained for the wheel in the past.

D. GOFF & SONS, Pawtucket, R. I., are the pioneers in the manufacture of car seat plushes in the United States, having furnished the plush for the first car upholstered here with the home-made product. This firm makes a specialty of car plush in distinction from furniture plush, and with its experience of twenty years in spinning and braiding worsted and mohair yarns, is now able to produce an article fairly rivaling the imported car plushes in all the essential qualities of color, durability and beauty of finish.

MR. THOMAS W. FREDERICK, South American Agent of the Westinghouse Air Brake Co., died at Para, Brazil, Oct. 3, of yellow fever. He was formerly assistant superintendent of the Pardee Car Works, at Watsontown, Pa., then inspector of West Shore cars at Pullman, Ill. He was also for a short time master mechanic of the road at Buffalo, and also assistant engineer.

THE SNELL MANUFACTURING CO., Fishdale, Mass., have recently commenced the manufacture of Auger and Car Bits of superior quality, also Ship Augers and Ship Auger Car Bits, and Machine Bits of every description. Prices furnished on application.

MR. EDWARD HILL, having severed his connection with N. & A. Middleton & Co., of Philadelphia, has been elected Secretary and Treasurer of The A. B. Davis Car Spring Co., Limited, of that city, with branch office in the Mills Building, New York.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Atlantic & Danville.—John A. Gee has resigned his position as Superintendent.

Baltimore & Ohio.—Wilbert Irwin has been appointed Superintendent of the Philadelphia Division, vice D. Connell, assigned to other duties.

Canada Atlantic.—E. J. Chamberlain has been appointed General Manager of this road.

Cincinnati, Hamilton & Dayton.—John Black has resigned his position as General Master Mechanic of the C., H. & D. system of roads.

Colorado Midland.—D. B. Robinson has been appointed General Manager, and Wm. Fuller Mechanical Superintendent.

Cumberland & Pennsylvania.—N. W. Howson has resigned his position as Master Mechanic to accept that of General Superintendent of the Eames Vacuum Brake Co., at Watertown, N. Y.

Danbury & Norwalk.—This road has been leased to the Housatonic, and will hereafter be known as the Danbury & Norwalk Division of that road.

Fitchburg.—J. F. Adams has been appointed Superintendent of the Western Division, vice W. I. Fox resigned.

Flint & Pere Marquette.—H. M. Perry has resigned his position as Master Car Builder to accept a similar one on the Atchison, Topeka & Santa Fe.

Indiana, Bloomington & Western.—John King has been appointed General Master Mechanic, vice E. Hiserodt, who is retained as Division Master Mechanic.

Lake Shore & Michigan Southern.—C. B. Couch is appointed Assistant General Superintendent. Mr. C. Mills succeeds Mr. Couch as Superintendent of the Eastern Division.

Louisville & Nashville.—Reuben Wells has been appointed Superintendent of Machinery, and Harvey Middleton Assistant Superintendent of Machinery.

Newport & Wickford.—J. B. Gardiner, Superintendent of the New York, Providence & Boston road, is to be Superintendent of this line also, in place of Theodore Warren, resigned.

New York Central Sleeping Car Co.—T. A. Bissell has been appointed Manager of the Buffalo shops, and W. O. Chase District Superintendent at Lake Shore Station, Chicago.

New York, Chicago & St. Louis.—John Mackenzie has resigned his position as Superintendent of Motive Power.

New York, Lake Erie & Western.—D. H. Blackham has been appointed Superintendent of the Susquehanna Division, in place of R. B. Cable, resigned; and Geo. W. West, Master Mechanic of the Mahoning Division of the New York, Pennsylvania & Ohio.

Ogdensburg & Lake Champlain.—F. W. Baldwin has been appointed Superintendent in place of E. J. Chamberlin, transferred the Canada to Atlantic road.

Richmond & Alleghany.—W. A. Crawley has been appointed Supply Agent in place of M. Sweeney resigned.

St. Louis, Arkansas & Texas.—W. R. Crumpton has resigned his position as General Superintendent.

St. Louis & Hannibal.—Richard Whalen has been appointed Master Mechanic, with office at Hannibal, Mo.

St. Louis & San Francisco.—D. H. Nichols has been appointed General Superintendent, and F. P. Wherry, Purchasing Agent.

Texas & Pacific.—A. H. Douglass has been appointed Division Master Mechanic.

Valley, of Ohio.—N. F. Wood, late of N. Y., P. & O., has been appointed Superintendent.

West Shore.—James McBeth has been appointed Master Mechanic of the Buffalo Division.

Employment.

WANTED.—By a young married man, a situation as Foreman Car-Builder; has had eleven years' experience in building and repairing passenger coaches and freight cars, and has served for some years as Master Car-Builder for a leading railroad. Can furnish good references. Address "W. N. C.," office of NATIONAL CAR AND LOCOMOTIVE BUILDER.

Gentlemen:—

How natural it is to try to get *something* for *nothing*, and expect satisfaction in the use of materials that look well, but have no real merit. This is exemplified in painting cars as much as anywhere. The Perfect Method Paints manufactured by us insure durability and saving of time otherwise lost in repainting, or lost by decay of the wood and rust of the iron when the paint has perished, as most of the ordinary paint soon does.

The Sherwin-Williams Co.

Manufacturers High Grade Paints and Colors for Railway Use. CLEVELAND AND CHICAGO.

Established 1856.

Shipman & Bolen, Mfrs. of fine

Railway Varnishes.

Our Varnishes excel in durability,

Newark, New Jersey.

FINEST QUALITY FIRE BOX AND BOILER PLATES

By the Crucible and Open-Hearth Processes.

HUSSEY, HOWE & CO. [Limited],

PITTSBURGH, PA.

The Oldest Manufacturers of Crucib'e Fire-Box Plates.

BEST QUALITY TOOL STEEL AND Standard Crucible Spring Steel.

Made Expressly for Railroad Use.

GEORGE WESTINGHOUSE, Jr., President. JOHN CALDWELL, Treasurer.
T. W. WELSH, Superintendent. W. W. CARD, Secretary. H. H. WESTINGHOUSE, General Agent.

THE WESTINGHOUSE AIR BRAKE COMPANY,

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE.

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 15,000 engines and 125,000 cars in all parts of the world. This includes 45,000 freight cars.

The WESTINGHOUSE AUTOMATIC BRAKE is the only continuous brake that has been successfully used on freight trains.

THE AUTOMATIC BRAKE will, in consequence of its quick application, stop a train in the least possible distance.

THE AUTOMATIC BRAKE on freight trains, as in passenger service, applies itself instantly to all parts of the train in the event of the train breaking into two or more parts, a feature of great importance in view of the statistics published in the *Railroad Gazette*, which show conclusively that a majority of the collisions are caused by the breaking in two of trains. (See *Railroad Gazette*, Feb. 12, 1886, page 113.)

THE AUTOMATIC BRAKE also applies itself to every car in the train, in the event of any accident to the brake apparatus of such a nature that it would render any non-automatic continuous brake inoperative.

THE AUTOMATIC BRAKE can be applied from the rear or from any portion of the train, if desired.

THE AUTOMATIC BRAKE will effect an increase of at least twenty-five per cent. in the efficient value of freight rolling stock, owing to the quicker time that can be made on the road, and the avoiding of delay at stations and sidings. Freight trains carrying perishable goods are being daily run on passenger schedules.

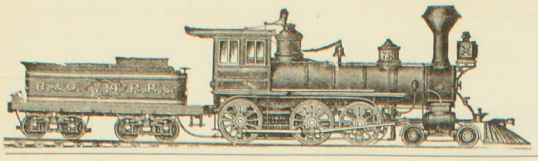
THE AUTOMATIC BRAKE, applied to freight cars, avoids the flattening of wheels and effects a yearly saving, in this item alone, nearly equal to the first cost of the apparatus.

THE AUTOMATIC BRAKE will prevent a greater part of the accidents to freight trains which form so large an item of expense in railway management.

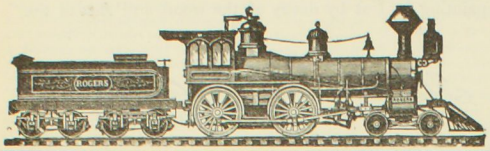
THE AUTOMATIC BRAKE will save employés from the danger and exposure to which they are now subjected, having to ride on the tops of cars in cold and stormy weather, and often sacrificing their lives in the discharge of their duties.

THE AUTOMATIC BRAKE is simple in construction and operation, and cheaply maintained, the working parts being combined in one piece of mechanism.

THE AUTOMATIC BRAKE is not an experiment, but is the result of many years of practical experience, and its capabilities are well known to all railway managers.

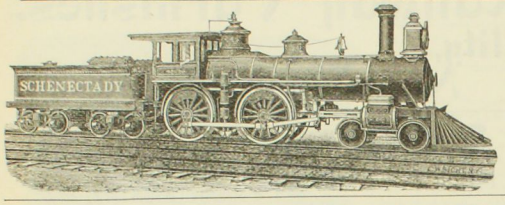


PITTSBURGH LOCOMOTIVE AND CAR WORKS
PITTSBURGH, PA.
MANUFACTURERS OF
Locomotive Engines for Broad or Narrow Gauge Roads,
From standard designs, or according to specifications, to suit purchasers.
Tanks, Locomotive or Stationary Boilers Furnished at Short Notice
D. A. Stewart, Prest. D. A. Wightman, Supt. Wilson Miller, Sec. & Treas.

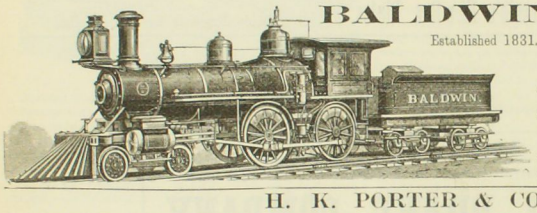


ROGERS LOCOMOTIVE AND MACHINE WORKS,
PATERSON, N. J.
New York Office, 44 Exchange Place.
Manufacturers of Locomotive Engines and Tenders and other Railroad Machinery
J. S. ROGERS, President. R. S. HUGHES, Secretary. WM. S. HUDSON, Sup't. } PATERSON, N. J
R. S. HUGHES, Treas., 44 Exchange Place, New York.

RHODE ISLAND LOCOMOTIVE WORKS,
PROVIDENCE, RHODE ISLAND.
EARL PHILIP MASON, Vice-President. CHARLES FELIX MASON, President. ARTHUR LIVINGSTON MASON, Secretary.
WILLIAM P. CHAPIN, Treasurer. JOSEPH LYTHGOE, Agent and Superintendent.



SCHENECTADY LOCOMOTIVE WORKS.
CHAS. G. ELLIS, President. EDWARD ELLIS, Treasurer
WALTER McQUEEN, Vice-President. A. J. PITKIN, Superintendent.
SCHENECTADY, N. Y.



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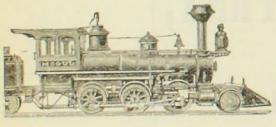
Established 1831. ANNUAL CAPACITY, 600.
LOCOMOTIVE ENGINES.
Adapted to every variety of service, and built accurately to standard gauges and template. Like parts of different engines of same class perfectly interchangeable.
Broad and Narrow-Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Noiseless Motors for Street Railways, etc.
Illustrated Catalogues furnished on application of customers.
BURNHAM, PARRY, WILLIAMS & CO., Proprietors, Philadelphia, Pa.



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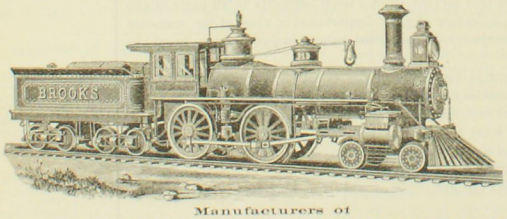
PITTSBURGH, PA.
LIGHT LOCOMOTIVES.
All work steel-fitted and interchangeable. Duplicate parts kept in stock.
Illustrated Catalogue mailed on application.

BROOKS LOCOMOTIVE WORKS
DUNKIRK, N. Y., U. S. A.

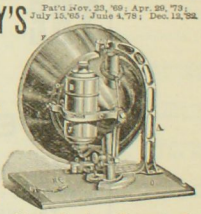


Manufacturers of
ALL CLASSES OF LOCOMOTIVES AND THE THURBER STEEL WHEEL.
H. G. BROOKS, President. M. L. HINMAN, Sec'y and Treas'r. J. H. SETCHEL, Sup't. R. J. GROSS, Traveling Agent.

POST & COMPANY'S
Pat'd Nov. 23, '69; Apr. 29, '73; July 15, '65; June 4, '78; Dec. 12, '82.
NEW PERFECTION SIDE-LIGHTING HEAD-LIGHT,
Largest AND BEST Head Light MADE.

View showing Side Signals, Numbers and Nicholson's Pat. Colored Signals, with Reflector turned in position for lighting. No more lanterns required on Engines.

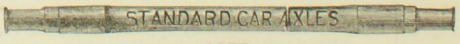
The New Reservoir is constructed on our American Student Lamp principle, which keeps the oil at a constant level until all is consumed, thereby saving 2 inches of each wick, and it overcomes the unsteadiness of the flame, caused by splashing of the large body of oil in the reservoirs of ordinary Head-Lights. This reservoir can be readily taken out to be refilled. Send for Circular of



View showing Manner of Mounting Reflector, and New Oil Reservoir.

REVOLVING AND STATIONARY LIGHTS.
POST & CO.,
Patentees and Manufacturers, CINCINNATI, OHIO.

GEO. E. SACKETT, Pres. J. T. WRIGHT, Sup
New Albany Steam Forge,
MANUFACTURERS OF



AND

Crank Pins, Equalizers, Slide-Bars, Connecting, Parallel and Piston Rods. Heavy Forgings of all Kinds of Iron and Steel.
Office and Works, New Albany, Ind

EWALD IRON COMPANY,
OWNERS AND OPERATORS OF
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Tennessee Charcoal Bloom Boiler Plate, Flange, Fire Box, Sheet, Bar and Stay-Bolt Iron.
ST. LOUIS OFFICE, - - - - - 801 NORTH SECOND STREET.
MANUFACTURE CHARCOAL IRON EXCLUSIVELY.